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ARCHIVES OF OTOLARYNGOLOGY

VOLUME 11 MARCH, 1930 NUMBER 3

CONTRIBUTIONS OF OTOLOGY TO NEUROLOGY*

J. GORDON WILSON, M.D.

CHICAGO

Within the last decade the advances in otology have been especially marked along two lines, one of which derived its impetus from physics; the other, from the biologic sciences. The pioneer work of Seashore, who perceived the necessity of more accurately measuring and recording the minimum audibility of sound, produced the siren audiometer, which has been modified and improved during the intervening years. This was followed by the Western Electric audiometer from the scientific department of the American Telephone Company, whose investigations to perfect the methods of transmission of sound, and especially of the voice, resulted in several instruments for testing minimum audibility. From the biologic side, increased knowledge of the function of the ear has been especially associated with the names of Magnus and his co-workers in Europe and of Maxwell and others in this country. From these has come a clearer perception of the function of the complex vestibular mechanism, though we are far from having a full understanding of the action of the labyrinth and its intricate associations.

It is a matter of congratulation that in these investigations no mean share has been taken by the members of the American Otological Society. Not only have advancements along both of these lines been made by them, but those made elsewhere have soon been brought to our attention, and members have been found capable of discussing them adequately, sifting the evidence presented and adapting them to their needs. In these, the Society has justified itself as a forum at which advances coming from physics and biology can be viewed dispassionately and their practical applications defined. Frequently, there has been a sharp divergence of opinion among the members, but such was incidental to a free discussion, for

> "There lives more faith in honest doubt,
> Believe me, than in half the creeds."

It has never been forgotten that the Society's chief object is to combat the diseases which, directly or indirectly, lie within its field. It has been recognized that progress necessitates keeping in touch with advances in other lines of medical research. This Society's actions in the past have demonstrated that it welcomes any source of knowledge

* Submitted for publication, Sept. 26, 1929.

* Expansion of the presidential address before the American Otological Society.

that will make its members better acquainted with the structure and function of the ear. For a long time, otology lagged behind its sister specialty ophthalmology, and I am not sure that even now it is quite in line with it. But otologists are rapidly making up the leeway. When one considers the relationships of aural and vestibular function, in which disorder may cause bodily disturbances, it is obvious that one has to deal with a wider field than ophthalmology. The view that a specialty is a focusing of attention on a particular part is no longer held. Disease is not self-limiting. Obscure symptoms are often to be explained by the disturbance of the interrelationship of separate parts of the biologic entity even in a remote field. Disturbed reactions which occur spontaneously or which are artificially produced may be capable of explanation only on the understanding of fundamental relationships. This is true of the complex vestibular mechanism.

To have discussed recent advances, both auditory and vestibular, in this paper would have gone beyond the limits I had assigned myself. I should have liked to appraise the advantage that has been derived from audiometry and to voice the feeling of regret that the early hopes of those who worked in this field have not come to full fruition. The audiometer of today has important limitations. I believe that the audiometer of the future will be more perfect, more easily workable and, it is to be hoped, less expensive. This is sure to come, for there are enthusiastic workers who are discerning its shortcomings and insisting on their removal. I, however, shall discuss some contributions which otology has made to neurology by means of observations on the modifications of the vestibular ocular reflex in intracranial lesions.

VESTIBULO-OCULAR REFLEX

In order that man may keep himself in a definite attitude or posture relative to the world around him, it is requisite that information of alterations of his posture, such as occur during movements which he as a living organism carries out, be rapidly given, and that a neuromuscular mechanism can immediately call into play compensatory forces to enable him to retain the posture he has assumed or to return to normal. The forces he has chiefly to combat are gravitational or rotational. The informative impulses come chiefly from three sources: the ear, the eye, and contact stimuli in joints and muscles. It is with the impulses from the ear, the vestibular afferents and the neuromuscular mechanism associated with them that this paper is concerned. These constitute the vestibular reflexes.

The vestibular reflexes are chiefly concerned with adjustments necessary to maintain an adequate posture in movements of the head. They are therefore tied up with certain muscle groups that are affected by movements of the head—the eyes, the neck muscles and, to a less

extent, the muscles of the face, the trunk and the limbs. I am here considering the first of these, the vestibulo-ocular, which is concerned with the adequate posturing of the eyes necessary to vision. This reflex has from the standpoint of diagnosis certain advantages.

1. The musculature of the eye is the most accurately balanced mechanism in the body and therefore one in which it might be expected that early disturbances of function would be recognizable.

2. It is easily observed, and the fundamental reflex (the slow deviation) is less influenced from other neural levels, especially the cortical, which lead, for example, to those modifications so disturbing in estimating the significance of the pointing error.

3. The vestibular reflex from the ear to the eye may be classed as a segmental reflex. It is a usable segmental reflex, just as is the knee jerk, and since its pathway is intracranial, it probably has greater diagnostic potentialities. As in no segmental reflex in man can one eliminate other neural influences, cortical or intersegmental, which normally or pathologically modify primary reflex action, so in the vestibular eye reflex there are such contaminating influences in cooperation or in antagonism which modify the impulse passing along the final common path; these have to be taken into account in the deductions drawn, e. g., in tumors of the cerebellopontile angle blocking the lateral recess (the foramen of Luschka) and causing auditory choking as well as cerebellar disturbance.

Abnormal changes in the primary vestibulo-ocular reflex produced by disease or by artificial stimulation of the end-organ are of value to help localize areas in which the disturbing factor is located. While I recognize that the available facts are often general and some are even open to dispute and that at present one lacks both physiologic and pathologic data to be dogmatic, yet I believe that there are sufficient data on some points to justify at least semiauthoritative statements.

The study of neuromuscular reactions from the labyrinth can be carried out in animals by destruction of the labyrinth or by artificial stimulation. Labyrinthine stimulation in man can be most easily produced by rotation, by the electric current or by changes of temperature. It is most common to employ water at a temperature of about 15 C. Such stimulation produces an oscillation of the eyes characterized by a slow deviation in one direction and a quick return to the opposite side, and it is this double movement that constitutes labyrinthine nystagmus as distinct from cerebellar nystagmus, to be referred to later. Destruction of the labyrinth or the action of cold water produces the slow deviation to the side affected. Hot water produces a slow deviation to the opposite side. In all of these reactions, there are conjugate movements of the eyes.

I have repeatedly pointed out that the terminology usually employed of naming the nystagmus from the quick component is unfortunate in that it tends to reduce to a position of secondary importance the essential factor in the movements, namely, the slow component;[1] the quick component follows and is complementary to the slow, and may be regarded as an attempted readjustment to normal. The results of this terminology have been unfortunate, and the misplaced emphasis should be discarded. This has resulted in faulty deductions in experimental work and a lack of perception of the slow drift and its significance so often seen in early lesions of the vestibular ocular path. However, it may be said that the significance of the slow component is gradually being recognized.

There are certain facts which in my opinion may be regarded as established:

1. If the lesion is confined to the labyrinth, the essential point is the deviation of the eyes to the side of the lesion. This is followed by a quick return toward the midline. In this nystagmus there are points which may be of diagnostic importance, namely, that it is increased by looking to the side opposite the lesion and diminished on looking to the side of the lesion; also, while conscious effort can control the quick component and keep the eyes toward the side of the lesion (and diminish the vertigo if present) conscious effort has little or no effect on the slow component and cannot keep the eyes away from the side to which it is directed; such an attempt makes the patient more uncomfortable.

2. When the lesion is confined to the labyrinth the duration of the nystagmus is short, three or four days at most. I have, however, frequently reproduced it in animals several weeks after unilateral labyrinth destruction by placing the head in an abnormal position. Cerebellar nystagmus can persist for months and even years; in one of my cases, it was apparent ten years after the injury. In short, *the loss of labyrinthine influence is quickly compensated; the loss of cerebellar influence is slowly, if ever, completely compensated.*

3. In lesions of the peripheral organ of the ear, the spontaneous vestibular reflexes observed are to be regarded as due to a loss of function and not to an increase of function, supposedly owing to irritation. If such an increase of function occurs, it must be rare, as I have never observed it. It would appear as a deviation of the eyes to the side opposite the lesion. Following a mastoid operation, especially in elderly

1. Wilson, J. G., and Pike, F. H.: The Mechanism of Labyrinthine Nystagmus and Its Modification by Lesions in the Cerebellum and Cerebrum, XVIIth International Congress of Medicine, London, 1913, p. 563; Arch. Int. Med. **15**:31 (Jan.) 1915.

people in whom the bone is sclerotic, one occasionally sees nystagmus lasting twenty-four or forty-eight hours which passes off without further disturbance. This, I believe, is due to labyrinthine disturbance and might be called an irritative lesion. But in no case have I seen the eyes deviated to the opposite side; the slow component is always to the side of the lesion, a depressive effect. After experimental destruction of the labyrinth in whole or in part in animals, as soon as the animal recovers from the anesthetic the spontaneous nystagmus observed indicates loss of function. Clinical cases have been recorded in which failure to recognize this has been followed by unfortunate results. In one such case, following acute inflammation of the left ear there was a slow deviation to the right and a quick return to the left; this was diagnosed as due to inflammatory involvement of the left labyrinth and not till five weeks later, when a choked disk resulted, was the patient operated on for left cerebellar abscess, as is explained further on.

OSCILLATIONS OF THE EYES FROM CEREBELLAR LESIONS

Nystagmus of cerebellar origin shows a slow deviation and a quick return in the horizontal plane. However, the essential point here is that a lesion of a lateral lobe of the cerebellum causes a deviation of the eyes to the side opposite the lesion. It will be noted that this is the opposite of what occurs in labyrinthine lesions. It is nearly twenty years since Dr. Pike and I demonstrated this experimentally in animals, at the same time showing that the vestibular ocular path does not pass through the cerebellum.[2] The latter is now usually conceded, though the deviation appears to be overlooked.

This deviation in man has frequently been observed, though not always so interpreted. It is clearly brought out in a case quoted by Ingvar,[3] of a definitely localized metastatic tumor in the right lobus biventer of the cerebellum, in which there was horizontal nystagmus, slow to the left and quick to the right. One rarely has an opportunity of seeing so clearly a defined case. The following, however, which helps to define my position, is not uncommon:

Case 1.—Joseph H. was admitted to Wesley Hospital, Dec. 14, 1925, in the service of Dr. Kanavel and Dr. Loyal Davis, with the complaints of vertigo, staggering gait with broad base, ataxia, blurring of vision, no motor involvement, no sensory disturbance and deafness in the right ear. There was occasionally spontaneous nystagmus on looking forward, with slow deviation to the left.

When the patient looked to the right, the nystagmus was slow to the midline, of the cerebellar type, as is shown further on. When the patient looked to the left, the deviation was slow to the midline, of the labyrinthine type.

2. Wilson, J. G., and Pike, F. H.: The Effects of Stimulation and Extirpation of the Labyrinth of the Ear, and Their Relation to the Motor System; Experimental, Philosophical Transactions of the Royal Society of London **203**:150, 1912.

3. Ingvar, Sven: On Cerebellar Localization, Brain **46**:321, 1923.

At operation, a capsulated tumor of the right lobe of the cerebellum, in close apposition to the pons, was found.

This difference in direction of the slow phase is not due to a break in the primary vestibulo-ocular path, for this pathway does not pass through the cerebellum. The explanation is not known, nor is its location definitely settled. It does not appear to me to be due to injury of the cerebellar cortex, even in its anterior part, for in animals I have repeatedly removed various parts of the cortex without producing it; but it does follow when the cerebellar nuclei are injured. As a result of many observations, my present hypothesis is that it is due to a loss of cerebellar influence on the vestibular nuclei of the same side; that is, it is a depressive and not an irritative effect.

To complete the picture of cerebellar nystagmus there must be superadded to this an ataxic movement of the eyes on looking to the right or to the left, increased by fixation. Dr. Pike and I pointed this out in 1912, and it has received abundant confirmation by Gordon Holmes and others.[4] This is the most distinctive feature of the nystagmus due to cerebellar lesions and justifies the term cerebellar nystagmus. During the World War, I had the opportunity of studying several such cases, in particular that of Private B, whom I saw five months after he received a shrapnel wound of the left cerebellum.

Case 2.—Private B., aged 30, was examined on Sept. 1, 1916. He had been wounded by shrapnel on April 6, 1916. The entrance wound was 1.5 cm. above and to the left of the occipital protuberance. The exit scar was 3 cm. posterior to the left external auditory meatus. The patient complained of headache and vertigo. The hearing was normal in both ears. When the eyes were examined, it was noted that there was no nystagmus on looking forward; on turning the eyes to the left there was a slow drift to the midline and a quick jerk back. When an object was fixed to the left, there were pendular horizontal oscillations; that is, oscillations showing no distinct quick and slow components. Then, after from two to five seconds came the roll to the midline followed by the quick jerk back for fixation. The pendular oscillations again appeared, followed at a brief interval by the roll to the midline.

On looking to the right, there was a roll to the midline and a quick jerk back. When an object was fixed to the right, less marked but rapid pendular oscillations were seen, followed at a much shorter interval by the roll to the midline. On looking up and to the left, on fixation, the oscillations were present. On looking up and to the right, the eyes on fixation were steady.

In all positions the oscillations were diminished or disappeared when lenses of 18 diopters were placed before the eyes, thus diminishing fixation.

The nystagmus was always horizontal. As the fixation approached direct forward vision, the pendular movements became finer till they faded away. I saw this patient again in 1926 when he was working daily. The nystagmus was still present and showed the same characteristics.

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4. Wilson and Pike (footnote 2); Relation of the Labyrinth to the Cerebrum and Cerebellum, Tr. Am. Otol. Soc., 1914. Holmes, Gordon: The Symptoms of Acute Cerebellar Injuries Due to Gunshot Injuries, Brain **40**:461, 1917.

The pendular movements on turning the eyes to the right and left on fixation are obviously of an ataxic nature and are more marked on looking to the side of the lesion. They persist for a long period even after the patient appears otherwise well and able to work. The ataxic component can be reduced or eliminated by glasses with lenses of 18 diopters. It will be noted that the pendular oscillations are more marked on looking to the side of the lesion and may be noticeable only then. In these respects, the movements are in distinct contrast to vestibular nystagmus.

LESIONS NEAR THE MESENCEPHALON

A lesion in or near the mesencephalon involving this area by direct or indirect pressure is often marked by a vertical nystagmus. It is in such lesions that one also gets dissociation of eye movements and such abnormal caloric reactions as perverted nystagmus.

Vertical Nystagmus.—Experimentally, the only location in dogs and monkeys in which I have consistently seen vertical nystagmus is in the region of the mesencephalon. This seems in agreement with the work of Ferrier, Adamük, and others.[5] One not infrequently sees clinical cases of otitic meningitis or encephalitis in which as the inflammation spreads forward, the horizontal nystagmus becomes associated with, or even displaced by, a vertical component.

CASE 3.—Dorothy L., admitted to Wesley Hospital in October, 1923, on the service of Dr. Kanavel, became ill with diplopia three months before admission, though headache, vomiting or optic neuritis were not present. She walked with a spastic, ataxic, hemiplegic gait, and staggered to the left. There was no evidence of auditory defect. There was paresis of the left fifth motor nerve, and of the sixth and seventh. Movements of the right hand were clumsy and paretic.

Spontaneous nystagmus was present. When the patient looked forward, the eyes at times rolled to the left. When she looked to the right and left, the movements were slow to the midline and quick back, of labyrinthine type. When she looked up, the movements were slow down with a quick jerk back, which was very noticeable.

The caloric test (cold) in both ears easily produced nystagmus. When the test was made in the right ear, the eyes rolled to the right with a quick jerk back, but deviation was more marked than the quick return; the left arm (nonparetic) showed little pointing error. When the test was made in the left ear, the right eye was fixed to the left; this increased when the head turned back; there was a pointing error to the left.

At postmortem, a glioma involving the upper part of the brain stem was found. The cerebellum was normal.

Dissociation of Eye Movements.—I have seen unilateral nystagmus in dogs after medial section of the brain stem. Experimental injury to the corpus quadrigeminum of the side to which the slow deviation of

5. Sherrington, in Schäfer: Text Book of Physiology, London, 1900, p. 912.

the eyes is directed does not abolish the nystagmus either in its slow or in its quick phase, but it does bring about dissociation of the eye movements.[6]

Case 4.—Mrs. B. S. was admitted to Wesley Hospital in June, 1926, on the service of Dr. Kanavel and Dr. Davis. On examination, it was difficult to elicit information from her; she did not hear well and was mentally embarrassed. She complained of frontal headaches, difficulty in walking, falling to the right, vertigo, with occasional vomiting, and sensation of rotation to the right. Her position in bed had no effect on the vertigo. There was tinnitus in both ears.

The drum membrane in both the right and the left ear was normal. A whisper could be heard at 3 feet with the right ear and at 1 foot with the left. Hearing for the C_3 fork was reduced 50 per cent in the right ear and 70 per cent in the left.

Both hands when held out deviated to the right. The left hand went down, the right hand up. On pointing, there was a marked deviation of the left hand to the right. The right hand pointed accurately.

There was paresis (partial paralysis) of both external recti. The left eye tended to deviate in. There was a unilateral nystagmus in the right eye, with a quick movement to the left, a slow movement toward the right going only slightly beyond the midline. The nystagmus in the right eye was marked on looking to the left; and at the same time a slight nystagmus was seen in the left eye, with a slow roll to the midline. No movement of the eyes upward was possible; when the patient was told to look up both eyes rolled in. She could move the eyes slightly downward.

In the caloric test of the left ear, reaction was produced with 2 ounces (59.2 cc.) of water at 14 C. The deviation was to the left, with a marked tendency of the right to turn in. The slow component was much more prominent than the quick component. The noticeable point was the strong roll in of the right eye to the left, with a strong rotatory component not present in the left. The pointing error was to the left, with vertigo.

In the caloric test of the right ear, a reaction was produced with 5 ounces (148 cc.) of water at 14 C. The deviation was normal, to the right. The right eye was markedly turned to the right, and the excursion of the nystagmus was wider than in the left eye. Even several minutes after the caloric test was stopped, the right eye was turned in to the right. The pointing error and vertigo were normal.

The condition was diagnosed as tumor of the midbrain, probably pineal in origin.

LESIONS ABOVE THE MESENCEPHALON

As the primary reflex vestibulo-ocular path is not interfered with, there is as a rule no labyrinthine nystagmus. Oscillations of the eyes have been described. I have seen them, but they were inconstant and tended to be of the pendular type. It appears to me, however, that there is frequently a change of the vestibular reaction from caloric stimulation of the ear, both quantitative and qualitative. The quantitative change is indicated by: (*a*) the rapidity with which the caloric

6. Wilson and Pike (footnote 1). Luciani: Human Physiology, London, 1919, vol. 3, p. 518. Sherrington (footnote 5).

reaction comes on; (*b*) its long duration; (*c*) the rapidity of the oscillations; (*d*) the severity of the malaise which accompanies it—vertigo and vomiting. I have found such quantitative changes not only in intracerebral lesions but in cases of psychoneurosis with vertigo as a complaint, or in minor vestibular disturbances in which the symptoms of vertigo appeared unduly predominant. The following cases illustrate the quantitative changes:

CASE 5.—Marvin P., aged 21, was admitted to Wesley Hospital, on the service of Dr. Loyal Davis, in February, 1928, with the complaint of occipital headaches and loss of vision. On examination, the patient was alert and intelligent; there was no anosmia; visual acuity was completely lost; he was unable to recognize the light thrown into his eyes by a flashlight; no sensory or motor symptoms, no ataxia and no dysmetria were present. Hearing was normal; there was no tinnitus, nystagmus or vertigo.

The caloric test in the right ear (4 ounces [118.4 cc.] of water at 15 C.) produced violent and prolonged nystagmus, slow to the right, vertigo, nausea, marked excitement and fainting. The test in the left ear (3½ ounces [104 cc.] of water at 15 C.) caused violent and prolonged nystagmus, slow to the left, great distress and excitement, nausea and vomiting.

(NOTE.—At this temperature, the average amount of water used to produce the caloric reaction is 7 ounces [207 cc.].)

At operation, a tumor lying between the posterior limbs of the chiasma and apparently coming from the region of the third ventricle was found.

CASE 6.—Mrs. R. H., aged 21, was admitted to Wesley Hospital in April, 1928, on the service of Dr. Loyal Davis, with the complaint of occipital headaches with vomiting, and of walking as if she were drunk, but no vertigo.

Examination revealed bilateral papilledema, no nystagmus and no sensory or motor disturbances, except with the left arm, which was clumsy and showed dysmetria and adiadokokinesis.

The audiometer chart showed hearing in the right ear to be fairly normal, and a marked defect in the left ear. The patient appeared in a stuporous condition. Tinnitus was present in the left ear. There was no nystagmus. When the patient was in the Romberg position, she fell back.

The caloric test in the right ear (2 ounces of water at 14 C.) produced pronounced nystagmus, slow to the right, a pointing error to the right and vertigo. The test in the left ear (1½ ounces [45 cc.] of water at 14 C.) caused marked nystagmus, slow to the left, pointing error and vertigo.

At operation, the cerebellum was normal; nothing abnormal was found in the posterior fossa; the lesion was not located, but the roentgenograms indicated a tumor in the region of the pituitary.

CASE 7.—Edward L., aged 39, was admitted to Wesley Hospital in December, 1926, on the service of Dr. Loyal Davis, with the complaints of parietal and frontal headaches and projectile vomiting; there were no vertigo, disturbance of equilibrium or motor or sensory symptoms. Bilateral papilledema was present. The patient was alert and intelligent. There were no cerebellar symptoms.

Hearing in both ears was normal; there was no tinnitus, spontaneous nystagmus or pointing error.

The caloric test in the right ear (3 ounces of cold water) produced nystagmus, slow to the right and of long duration, normal pointing error and pronounced

vertigo. The test in the left ear (7 ounces of cold water) caused normal nystagmus, slow to the left, normal pointing error and vertigo.

A note was added as a result of these observations that the tumor probably lay above the midbrain and on the right side.

At operation, no cranial tumor could be located, but the right ventricle gave a cloudy opaque fluid and the left a clear colorless fluid.

A qualitative change can be observed at times following caloric stimulation in lesions immediately above the mesencephalon. In these cases, following the caloric reaction in each ear, there is either a falling out of the rapid phase on one side or such a disproportionate persistence of the slow phase as to attract attention. It is unfortunate that the clinical significance of this has been lost in the physiologic controversy of the origin of the quick phase.

Case 8.—Clarence W., aged 44, was admitted to Wesley Hospital in April, 1924, on the service of Dr. Hamill, with the complaint of bitemporal headaches with nausea and vomiting. There was no vertigo. Papilledema was present in both eyes and slight tinnitus in the left ear. Hearing was diminished in both ears but chiefly in the left; the deafness was of the nerve type. The Rinne test was positive in both ears; the Weber test was referred to the right; bone conduction was diminished. There was no pointing error; the patient tended to fall to the left; if the hands were held out, the left fell down and out. There was no spontaneous nystagmus on looking forward or to the right or left. On looking up, there was a slow drift down.

When the caloric test was made, the patient was in bed, and was weak and mentally dull. The reaction was easily produced with cold water in both ears. When the test was made in the right ear, the eyes deviated to the right but with no quick return. In the left ear, it gave rapid oscillations of the eyes in which no quick or slow phase could be differentiated. If the patient looked to the left, this was diminished. If he looked to the right, the nystagmus assumed the vestibular type (slow, quick).

At postmortem examination, a glioma of the inferior horn of the right lateral ventricle was found involving the sublenticular part of the internal capsule. Similar cases have been observed by others, e. g., Jones and Fisher.[7]

My interest in this subject was aroused by the results of experimental work that Dr. Pike and I carried out on dogs and monkeys, first published in 1912. In this article the results of our experiments on the removal of a cerebral hemisphere "suggested to us a cortical mechanism affecting the nystagmus."[8] Subsequent experiments confirmed this. We found that if a cerebral hemisphere is removed more or less completely, especially if the region involved is interal to the temporal lobe, stimulation of the labyrinth on the side of the lesion with cold water gave deviation of the eyes and either no true nystagmus or altered phasic

7. Jones, I. H., and Fisher, Lewis: Equilibrium and Vertigo, Philadelphia, J. B. Lippincott Company, 1918, p. 444.

8. Wilson and Pike (footnote 2, p. 152).

time, and that stimulation of the same labyrinth with hot water gave normal nystagmus.

The deductions we made were: (*a*) Lesion of a cerebral hemisphere on the side to which the slow component is directed abolishes or reduces the quick component. (*b*) There is a location above the mesencephalon from which the quick component comes or which influences its occurrence.

The following experiments by Dr. Pike and myself exemplify our contentions:

The left temporal lobe in a monkey was removed on June 17, 1913.

On June 18, there was paresis of the right limb. The eyes were freely movable in all directions but tended to move to the left. Rotation to the right showed after-nystagmus, slow to the right, quick to the left, with a duration of twenty-eight seconds. On repeated rotation, there was an after-nystagmus of thirty-two seconds. On rotation to the left, after-nystagmus gave a violent movement of the head, with oscillation of the eyes lasting about sixteen seconds.

On June 19, when the right ear was irrigated with cold water, vigorous nystagmus, slow to the right and quick to the left occurred. When the left ear was irrigated with cold water, nystagmus was slow to the left, with a slight irregular quick jerk back. Irrigation of the right ear with hot water produced the same type of nystagmus as that elicited with cold water; it was marked, and in the same direction (a reversal effect).

On June 20, irrigation of the left ear with cold water showed deviation to the left, but no nystagmus. Irrigation of the right ear with cold water produced deviation to the right, with marked nystagmus. The left ear, irrigated with hot water, produced slight but marked nystagmus. Irrigation of the right ear with hot water caused deviation to the left, but no nystagmus.

The animal lived for several weeks, and on July 9 the same results were obtained. At postmortem examination, the left temporal lobe and the adjacent part of the cerebrum were removed; the left thalamus was slightly damaged.

On April 10, 1913, the right cerebral hemisphere of a dog was removed. A trephine opening was made preparatory to destruction of the left labyrinth. The dog was allowed to recover from the ether anesthesia.

When the left trephine opening was irrigated with cold water, nystagmus was slow to the left and quick to the right. Hot water in the left trephine opening produced strong deviation to the right, and no quick jerk back. At postmortem examination, the right hemisphere was completely removed, involving the right thalamus. A blood clot was found in the cranial cavity extending under the pons and medulla.

The clinical significance of these observations has been obscured by the question of the location and mechanism of the quick phase. Any discussion of this subject would obscure my main proposition that the mechanism of nystagmus involves an area above the mesencephalon, and that there is frequently a qualitative and quantitative reaction to caloric and rotational stimulation to be demonstrated in cerebral lesion. As further evidence of this, I quote the results obtained by de Barenne

and de Kleijn [9] in their study of vestibular eye reflexes following destruction of a cerebral hemisphere in rabbits. They summarized their results as follows:

After extirpation of one cerebral hemisphere (for instance, the left) one notes:

(*a*) With simultaneous irrigation of both auditory canals with cold or warm water, no nystagmus sets in.

(*b*) The Nachnystagmus after right rotation, the cold water nystagmus with the irrigation of the right auditory canal, that is, a nystagmus with rapid component toward the left, is stronger than the nystagmus when the opposite stimulus is used, that is, a nystagmus with rapid component toward the right.

(*c*) In a rabbit with, for instance, a left sided labyrinth extirpation in which therefore only one labyrinth is working, the Nachnystagmus, after extirpation of the left cerebral hemisphere and in spite of the left labyrinth extirpation, is nevertheless stronger after right rotation than after left.

Results obtained by Bauer and Leidler [10] also lend support to this. They made the following experiment on a rabbit:

KANINCHEN 13.—1 März: Extirpation der Rechten Grosshirnhemisphäre (Vordere und seitliche teilweise auch hintere Partien) 5 mal nach rechts: ø Zuckungen; 5 mal nach links: 4 Zuckungen. 10 mal nach rechts: ø Zuckungen; 10 mal nach links: 14 Zuckungen. Querschnitt durch das ganze rechte Gehirn vor den Vierhügeln. 5 mal nach rechts: ø Zuckungen; 5 mal nach links, 3 Zuckungen. 10 mal nach rechts: 4 Zuckungen; 10 mal nach links: 21 und 46 Zuckungen.

3 März: 5 mal nach rechts: 5 Zuckungen; 5 mal nach links: 27 Zuckungen.

Zweite Operation.—Fortsetzung der Extirpation des rechten Grosshirns. 10 mal nach rechts: 14 Zuckungen; 10 mal nach links: 22 Zuckungen. Entfernung der hintern Partien der Hemisphäre bis an die Basis. 5 mal nach rechts: Einstellung nach rechts, dann 6 typische Zuckungen. 5 mal nach links: 15 sehr kleine Zuckungen.

I believe, and have so stated, that the primitive vestibular mechanism persists in all vertebrates, but in higher vertebrates there is an ever increasing association with centers above the mesencephalon. This does not mean a retrogression of the vestibular system in man but a higher degree of adaptability on the part of a more complex motor system. I do not say that the red nucleus and the cells that extend from these to the medulla may not act in part as Magnus outlined.[11] All I plead for is the consideration of the possibility that some part of the function

9. De Barenne and de Kleijn: Ueber vestibuläre Augenreflexe: V. Vestibularuntersuchungen nach Ausschaltung einer Grosshirn-hemisphäre beim Kaninchen, Arch. f. Ophth. **111**:391, 1923.

10. Bauer and Leidler: Enfluss der Ausschaltung verschiedener Hirnabschnitte auf die vestibularen Augenreflexe, Arb. a. d. neurol. Inst. a. d. Wien. Univ. **19**:206, 1912.

11. Magnus and de Kleijn: Experimentelle Physiologie des Vestibularapparates bei Säugetieren mit Ausschluss des Menschens, Handbuch der Neurologie des Ohres, 1923, vol. 1, p. 465.

of these areas has been transferred in man to other and higher areas or, at any rate, that profound influences above the midbrain are to be considered. I believe that one should not forget that other modifications have already occurred in the vestibular system, and that one should not be too dogmatic in transferring experimental data from rabbits to man. This is in keeping with the phylogenetic development of the brain. To explain the facts observed as a phase of cerebral inhibition seems but to strengthen the argument for such a transference. What does a cerebral inhibition imply? The physiologist cuts off the so-called inhibitory influence and then considers only the effect of its absence on a center which probably, because of this cut-off, has augmentation of afferent forces from other sources. What was cerebral inhibition doing before it was cut off? Inhibition is a positive and not a negative quantity. Suppose an inhibitory center *A* in the cerebrum is controlling the red nucleus. To do so adequately, Center *A* must get information from the periphery concerning equilibrium, and therefore peripheral influences must pass up higher than the brain stem, and interference with them may modify the vestibular reflex. That recognizable modifications of the vestibular ocular reflex can be produced by cerebral lesions appears evident from the foregoing experimental and clinical data. Their applicability in diagnosis appears to me of importance. One can afford to wait for the physiologic explanation.

SUMMARY

1. The vestibulo-ocular reflex shows early disturbance of labyrinthine function.

2. A lesion of the labyrinth results in loss of function, shown by slow deviation to the side of the lesion with quick return to the opposite side.

3. A lesion of a lateral lobe of the cerebellum results in slow deviation to the side opposite the lesion and quick return to the side of the lesion.

4. In cerebellar lesions, there is an ataxia of the eye muscles on fixation, most marked on looking to the side of the lesion.

5. Differential diagnosis of labyrinthine and cerebellar lesions can be aided by a comparison of the lesions mentioned in paragraphs 3 and 4, though these may be obscured by lesions affecting both.

6. Loss of labyrinthine function is quickly compensated; loss of cerebellar function is slowly, if ever, fully compensated.

7. Intracranial lesions near the midbrain are marked by vertical nystagmus and dissociation of eye movements (unilateral nystagmus, abnormal caloric reactions, etc.).

8. Intracranial lesions above the midbrain do not interfere with the vestibulo-ocular reflex but at times give a qualitative and quantitative change in the vestibulo-ocular reflex from caloric reaction, and rotation.

9. Cerebral inhibition can control nystagmus (certainly the quick phase) and this suggests a center above the midbrain receiving information from the periphery.

POSTTONSILLECTOMIC PULMONARY ABSCESS

MEDICAL ASPECTS *

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Posttonsillectomic pulmonary abscess is that condition of the lungs characterized by consolidation and necrosis which follows shortly after the removal of tonsils. Consolidation and abscess are possibly different stages of the same process, and hence many so-called ether pneumonias might be included in this study.

ETIOLOGY

The complication generally begins from twenty-four to forty-eight hours after operation and is characterized by fever (sustained or hectic), sweats, anorexia, malaise and a dry harassing cough terminating, in from ten to fourteen days, with foul expectoration. Much discussion has arisen regarding the cause of this pneumonic process and its advanced stage of necrosis. Both the aspiration and the embolic theories have certain arguments in their favor, and I shall summarize them as concisely as possible.

Aspiration.—This seemed the most logical theory for many years, because mucus and blood from the mouth have been found in the trachea and larger bronchi by bronchoscopy after tonsillectomy. According to a statement by Fischer,[1] Myerson studied 200 patients after tonsillectomy under general anesthesia and found blood and mucus in 155, although none of this series developed pulmonary abscess. Motor driven forms of apparatus for administering general anesthesia had been blamed for blowing the pharyngeal contents into the trachea. Experimenters, however, have pushed pyogenic material into the bronchi and injured the walls in the hope of producing infection. Septic material has been injected into the peripheral pulmonary tissue by a needle thrust between the ribs, but without the production of disease. In 1927, Smith [2] reported that he was able experimentally to produce abscesses by the following technic. Bloody scrapings from teeth afflicted with pyorrhea, showing microscopically spirochetes, fusiform bacilli and

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* Read at the Twelfth Annual Meeting of the American Bronchoscopic Society, July 6, 1929.

1. Fischer, A. E.: The Pulmonary Sequelae of Tonsillectomy in Children, Am. J. M. Sc. **176**:253, 1928.

2. Smith, D. T.: Experimental Aspiratory Abscess, Arch. Surg. **14**:231 (Jan.) 1927.

cocci, were slowly injected into the trachea of guinea-pigs, rabbits and mice; 50 per cent developed pneumonia and 20 per cent abscesses, and 30 per cent escaped disease, possibly owing to acquired resistance. Crowe and Scarff [3] produced pulmonary abscesses in dogs by placing a plug of cotton, saturated with spirochetes, etc., from pyorrheal scrapings, in a bronchus, but they were unable to find the disease when the plug was saturated with pneumococci, streptococci, staphylococci and colon bacilli. They also obtained the same type of abscess by placing the spirochetal plug in the frontal sinuses of two dogs, and concluded that the ensuing infection was aspirated into the lungs during sleep. Allen's [4] experiments with pus from a human bronchiectatic cavity showed that the spirochetes, if exposed to room temperature, die in about thirty minutes, while if the transfer is made to dogs at once, abscesses result; furthermore, that if the spirochetal infection is "trapped" in the smaller bronchi, abscesses develop. The reason that aspirated material does not always cause disease is that cough, ciliated epithelium and wandering cells in the blood get rid of much infection before trouble results. Kline [5] produced gangrenous pulmonary lesions in rabbits by intratracheal injections of spirochetes and fusiform bacilli from the sputum of a gangrenous pulmonary abscess and from carious teeth. Aschner,[6] in reviewing ten cases of bronchiectatic abscesses following tonsillectomy under general anesthesia, expressed his belief that they begin as a bronchial infection and spread into the pulmonary tissue. Furthermore, the fact that thrombi were present in the pulmonary veins and not in the pulmonary arteries is evidence against the embolic etiology of pulmonary abscess. Experimentally, if the pharynx and base of the tongue have been deeply anesthetized and the swallowing reflex abolished, material from the mouth will flow directly into the lungs. This has been seen in injections of iodized poppy seed oil 40 per cent. From this one can see that aspiration of material from the mouth does occur during or after tonsillectomy and that experimentally it has produced abscesses. But as Schlueter and Weidlein [7] and others suggest, it may require "preexisting pulmonary disease, irritation from the anesthetic, old age and debility" to produce the pneumonia or abscess.

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3. Crowe, S. J., and Scarff, J. E.: Experimental Abscess of the Lung in the Dog, Arch. Surg. **16**:176 (Jan.) 1928.

4. Allen, D. S.: Etiology of Abscess of the Lung, Experimental and Clinical Studies, Arch. Surg. **16**:179 (Jan.) 1928.

5. Kline, quoted by Schlueter and Weidlein (footnote 6).

6. Aschner, P. W.: The Pathology of Lung Suppuration, Ann. Surg. **75**:321, 1922.

7. Schlueter, S. A., and Weidlein, L. F.: Post-Operative Lung Abscess: An Experimental Study, Arch. Surg. **14**:457 (Feb.) 1927.

Embolism.—Holman, Chandler and Cooley,[8] Cutler and Holloway [9] and Schlueter and Weidlein [7] have produced pulmonary abscesses in practically all their experiments by setting free infected emboli in the jugular vein. Cutler showed that if the infected thrombus remained in the vein of its recipient for forty-eight or more hours, the pulmonary disease resulting from its mobilization was often a pneumonia of varying degree, while those thrombi of a shorter duration produced abscesses. The same was true if the embolus was transferred to another animal. From this he concluded that the virulence of the organism was lowered by its stay in the host. Furthermore, if the animals were protectively vaccinated, the disease caused by the embolus tended to heal much more than in the unprotected animals. Further evidence in favor of the embolic theory is that several observers have noted a greater percentage of pulmonary complications when local than when general anesthesia was used. Grégoire noticed pulmonary complications in 9 per cent of patients operated on under local anesthesia, and Mandl reported in hernia operations more pulmonary complications under local than under general anesthesia but the reverse after goiter operations. The advocates of this theory also emphasize the fact that a high percentage of abscesses follows operations in potentially infected fields and also the greater percentage of abscesses following operations in mobile operative areas such as the throat. Schlueter and Weidlein compiled reports of 1,908 pulmonary abscesses; they found that 29.61 per cent were postoperative and that one half of these were post-tonsillectomic. Morrison[10] reported 241 pulmonary abscesses investigated, 40, or 16.5 per cent, being postoperative and 20, or 8.3 per cent, post-tonsillectomic. In the present series of 42 abscesses (12 more than previously reported [11]), 18, or 44 per cent, were postoperative and 8, or 19 per cent, were post-tonsillectomic. Lyman reported 20,000 tonsillectomies under nitrous oxide anesthesia without a single known abscess; Hedblom, 20,000 at the Mayo Clinic, with 2 known abscesses; Moore, 450,000, with 202 abscesses and Herb, 12,045 tonsillectomies under general anesthesia, with 2 abscesses. At Stanford University, Dr. Sewell's department has not noted an abscess in many years. The foregoing data should all be

8. Holman, E.; Chandler, L. R., and Cooley, C. L.: Experimental Studies in Pulmonary Suppuration, Surg. Gynec. Obst. **44**:328, 1927.

9. Cutler, E. C.: Postoperative Abscess of the Lung, Proc. Inst. Med. **6**:199, 1927. Holloway, J. W.; Schlueter, S. A., and Cutler, E. C.: Relation of Immunity to the Experimental Production of the Abscess of the Lung, Ann. Surg. **86**:165, 1927. Cutler, E. C.: The Etiology of Post-Operative Abscess of the Lung, Ohio State M. J. **24**:109, 1928.

10. Morrison, L. F. M.: Pulmonary Abscess: Post-Operative, California & West. Med. **27**:792, 1927.

11. Pierson, Philip H.: Non-Tuberculous Pulmonary Suppuration, California & West. Med. **27**:4, 1927.

qualified with the adjective "known," for in large series some patients obtain treatment for this complication from some unknown source. It can be considered definitely an unusual complication in view of the large number of operations performed.

BACTERIOLOGY

The records on this subject are somewhat vague, and this may be explained on two grounds: 1. The study is often made by inexperienced bacteriologists who report the bacteria found in a chance loop of sputum and fail to appreciate the fact that the spirochetes are often present in minute whitish-yellow globules. 2. As these anaerobes do not grow except when specially planted, cultures merely enumerate the organisms found on the surface of the mediums. Besides the common organisms, such as different forms of streptococci, staphylococci, diplococci, etc., some careful observers have frequently found spirochetes, fusiform bacilli, vibrios and cocci, especially at the time when the sputum was foul. In the present series, in almost all cases is reported a predominance of a gram-positive diplococcus appearing in clumps or short chains. In only one was the fusiform bacillus mentioned. I emphasize this point somewhat, for in all probability the foul odor so frequently encountered is due to the spirochetal group mentioned and not to the aerobic group. Possibly the complication would be pneumonia if the aerobic bacteria alone were present, as the anaerobes account for the abscess formation.

SYMPTOMS AND PHYSICAL SIGNS

Some authors have tried to differentiate the type of abscess—aspiration or embolic—by the history. A constant dry cough beginning at once after operation suggests an aspirated foreign body. The complication beginning suddenly with sharp pleuritic pain suggests an embolus. In general, cough, which at first is dry, begins between the third and seventh day and by the tenth to fourteenth day is productive of foul sputum, often in considerable amount and frequently mixed with blood. Accompanying the cough and expectoration there are generally the following symptoms in the order of their occurrence: malaise, chills, fever, sweats, pain in the chest, anorexia and loss of weight.

Physical signs are remarkably absent even in well developed disease. This is easily explained, because the process is generally separated from the visceral pleura by a cushion of relatively normal lung. Dulness is the most constant sign. Often diminished harsh breath sounds are all that accompany this. Whispered voice is increased, and occasionally a few postexpiratory cough râles are heard. When the disease has gone

on to an advance stage of cavitation, cracked pot resonances and amphoric whisper may be present.

DIAGNOSIS

The early diagnosis of pulmonary abscess is often made on the history which is most important, the paucity of physical signs compared with those present over a tuberculous area of the same size, the roentgen appearance and the laboratory observations of leukocytosis, sputum negative for tubercle bacilli and sometimes containing elastic fibers, and the objective signs of cough, fever, elevation of pulse rate and varying degrees of prostration. The differential diagnosis must consider pneumonia, an exacerbation of tuberculosis, neoplasm causing bronchostenosis with infection distal to the obstruction, and granulomas such as coccidioidal, etc.

TREATMENT

The treatment begins as soon as the diagnosis is made and calls for the closest cooperation between the bronchoscopist, surgeon and internist, a team that must work in perfect harmony. Miller [12] spoke of this as a "system of management" rather than a "method of management." Intensive medical treatment will result in cure in about 50 per cent of the cases. By medical treatment I mean absolute rest in bed, with abundant fresh circulating air, high caloric diet and postural drainage. Pritchard,[13] Burrell [14] and others emphasized a long period of rest in bed—several months—even in the most favorable cases. This I heartily endorse, for often the process of absorption of the exudates and granulation tissue is halted by the patient's getting out of bed too early, thus disturbing the powers of resistance. The more scar tissue that remains, the greater is the opportunity for bronchiectasis to develop. Heliotherapy is a great aid as a general tonic. Expectorants are at times helpful in loosening the sputum and preventing the fatigue of unproductive cough. Sedatives should be reserved for use at night as a rule, if necessary to insure rest. They should rarely be given during the day, for they will definitely thwart the purpose of evacuating the abscess. Cardiac stimulants at times are necessary. Because of the spirochetal group of bacteria, arsphenamine has been used to advantage in selected cases.

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12. Miller, J. A.: Medical Aspects of the Treatment of Abscess of the Lung, New York State J. Med. **27**:43, 1927.

13. Pritchard, J. S.: The Value of Rest in Cases of Empyema and Lung Abscess, J. A. M. A. **79**:2208 (Dec. 30) 1922.

14. Burrell, L. S.; Edwards, A. T., and Martin, G. E.: Discussion on Treatment of Chronic Non-Tuberculous Infections of the Lungs, Proc. Roy. Soc. Med. (Sect. Med., Surg. & Laryngol.) **20**:35, 1927.

POSTURAL DRAINAGE

Special mention should be made of postural drainage. Experimentation in each case will determine that position which favors expectoration most easily. Some physicians favor gradual raising of the foot of the bed up to 14 or more inches on shock blocks, the patient lying on his stomach. Others hang the patient vertically down from the waist over the side of the bed. This is rather severe treatment for the very sick person. Mandelbaum [15] has devised an apparatus for jackknifing the patient over a bar, a procedure which favors postural drainage and pressure under the diaphragm. The most successful method is generally the one which the patient will take voluntarily at frequent intervals, and in which he will be most relaxed. In the hospital I have used a padded inclined plane from the side of the bed to the floor, while in the homes an inverted chair tilted up to the bedside is simple and efficient. The patient lies across the bed, bending at the hips onto the inclined plane. Sometimes the knee-chest position is easily carried out.

BRONCHOSCOPY

If postural treatment alone will effect satisfactory drainage of the cavity, the abscess may be expected to heal. This will be evidenced by a fall in temperature, decreased expectoration, increasing strength and roentgen evidence of diminution in the surrounding pneumonia and the size of the cavity. But if the outlet of the cavity into the bronchus becomes blocked by granulation tissue or extremely thick pus and débris, it is time to perform bronchoscopy if it can be performed by one well versed in its use. One of the patients in the present series was making good progress when this seemed halted for a couple of days. The temperature rose, and the sputum decreased slightly. The roentgenogram showed the abscess tense with pus. An emergency bronchoscopy was done; the granulations and débris were cleared away, and out rushed the pus which was under some pressure. Convalescence continued favorably. In post-tonsillectomic pulmonary abscesses, bronchoscopy has been used to maintain the patency of the drainage tract when nature could not do it herself. This will be discussed more at length in the papers by Dr. Schall and Dr. Clerf.

This system is given from eight to ten weeks' trial, and is continued if satisfactory progress is made, as evidenced by decreased toxicity, diminished sputum and roentgenologic evidence of improvement. If there is failure to make progress under medical and bronchoscopic treatment in from eight to ten weeks, the time for surgical measures has arrived. The abscess has had time to become walled off, and sur-

15. Mandelbaum, M. J.: Postural Treatment of Lung Suppuration, Arch. Int. Med. **40**:840 (Dec.) 1927.

gical dangers are much reduced. This period of watchful waiting, even in those cases in which surgical intervention was anticipated because of the duration of the abscess, has placed the patient in a position in which the disease will yield much more readily to operation.

POSTOPERATIVE MANAGEMENT

Prolonged rest in bed is important for the absorption of the exudates and granulations, exactly as in tuberculosis. The sooner the patient gets about, the more fibrosis will develop, leading to bronchiectasis. When the opportune time arrives, foci of infection should be removed to prevent drainage of infected material into the system and perhaps directly into the lungs already rendered more vulnerable. It is a mistake to allow these patients to become obese, for this often predisposes to infections of the respiratory tract. Heliotherapy and massage, together with active motion while in bed will help build a stronger physique. Comparative roentgenograms are the best guide as to the rapidity of healing and consequently as to when the patient should be allowed more freedom.

PREVENTION OF PULMONARY ABSCESS

Appreciating the fact that abscesses occur from both aspirated material and emboli and that preceding disease in the lungs provides a more fertile field for localized trouble, I would suggest the following as possible preventive measures:

(1) Preoperative complete examination of the patient with special reference to his lungs. Operation should be delayed if there are acute infections of the respiratory tract; some of these show no signs in the lungs, the patient complaining only of cough. Chronic or recurring bronchitis should be cleared up as much as possible by rest in bed, etc., before tonsillectomy. In tuberculous patients, a period of rest in bed should precede operation to improve the local as well as the general status; if possible, these patients should be in a stage of improvement when operation is performed. Ether should be avoided chiefly because of its irritative action on the tuberculosis.

(2) Hygiene of the mouth: I favor the extraction of poor teeth and scaling all tartar from those remaining before operation is instituted. Often there is an equal choice as to whether tonsillectomy or dental work should be done first. The foregoing facts suggest the dangers of spirochetes in excess being present in the mouth.

(3) Local anesthesia: For most adults this type of anesthesia has advantages well recognized. Any form of anesthetic used should not be carried to the point of abolishing the swallowing or cough reflex, and should avoid forcing foreign material through the larynx.

(4) Suction apparatus: Such apparatus is in practically universal use and of particular benefit if the patient can be in the horizontal position.

(5) Avoidance of unnecessary crushing of tissue and mass ligations, which favor the formation of thrombi. There is no reason why these thrombi may not contain spirochetes, etc., as well as the aerobes.

(6) Care of the mouth immediately after as well as before operation.

SUMMARY

Pulmonary abscesses follow, although not frequently, operation on the upper respiratory tract and teeth, and may be produced by aspiration or emboli. The anaerobes may be of particular importance in the formation of abscesses in otherwise merely pneumonic processes. Physical signs are less helpful than a carefully secured history and a series of roentgenograms in the diagnosis and management of the disease. The bronchoscopist and surgeon are most important members of the team, and should frequently be in consultation with the internist. Medical treatment offers a much brighter outlook per se and as a preparation for operation than was the case in early surgical procedures. Some abscesses may be prevented by thorough examination of the patient, to rule out acute and localized pulmonary disease and by more attention to hygiene of the mouth before and after operation.

POSTTONSILLECTOMIC PULMONARY ABSCESS

FACTORS IN HEALING *

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SAN FRANCISCO

As knowledge in the treatment of patients with intrapulmonary abscess is gained and recorded, it becomes increasingly evident that there are various routes which may be, and which sometimes must be, traversed before ultimate recovery from such an abscess is achieved. The most favorable time for the cure of the abscess is during the period immediately following its inception, and the treatment then will necessarily be different from that attempted at a later stage when the thickened, rigid walls of the abscess present one of the most baffling problems in surgery.

As an illustration of the effect of early treatment properly applied under the cooperative management of physician, bronchoscopist and surgeon, the following case may be cited.

REPORT OF CASES

G. B., single, aged 27, an Italian laborer, had an appendectomy under ether anesthesia in November, 1927, with an uneventful convalescence. Two weeks later, a tonsillectomy was performed with the patient under ether anesthesia. Immediately after recovering from the second anesthesia, the patient began to cough. This cough was nonproductive for several days, except for occasional blood-streaked mucus. On about the fifth to the seventh day he began spitting up a thin, greenish, foul-smelling sputum, which gradually increased in quantity. He remained in the hospital for only ten days after the operation, when he was permitted to leave. Since that time he had had a constant productive cough, foul breath, night sweats, loss of appetite and weight, an afternoon fever and pain in the right side of the upper part of the chest (fig. 1).

Examination six weeks after the tonsillectomy elsewhere revealed a slight increase in respirations and pulse rate, a definite lagging of inspiratory movements on the right side and slight impairment to percussion anteriorly just below the clavicle, where occasional râles were heard. There was a distinct early clubbing of the fingers. The fever ranged from 37 to 38.4 C. (98.6 to 101.1 F.); the pulse rate from 80 to 100, and respirations from 20 to 24. The sputum ranged in amount from 250 to 375 cc. daily, and the amount was not altered by different postures. During a week's rest in bed, the patient's fever and pulse showed little improvement, and on the eighth day a bronchoscopy was performed. A moderate amount of pus was seen in the main bronchus on the right, and the bronchus to the upper lobe of the right lung was occluded by a pointing projection of granulations. A curved

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* From Stanford University Medical School.

* Presented before the American Bronchoscopic Society, San Francisco, July 6, 1929.

aspirator was passed into this bronchus, and a "considerable amount" of pus was aspirated. Following this, there was a temporary increase in the amount of sputum from 300 to 375 cc., but on the twelfth day after admission it dropped to 180 cc. and on the fourteenth day to 90 cc. A definite improvement in temperature and fall in pulse rate occurred also. Bronchoscopy was again performed on the fourteenth day with aspiration of only a small amount of pus, and on the twenty-first day bronchoscopy failed to obtain any pus. On the twenty-eighth day only the slightest amount of pus was obtained at bronchoscopy, and on the thirty-fifth day only 1 cc. was obtained.

The temperature during the past four weeks had been practically normal, and sputum had decreased to about 15 cc. daily. There had been an almost complete cessation of cough, a remarkable subjective improvement, with a gain in weight from 145 to 150 pounds (65.8 to 67.9 Kg.).

The changes in the roentgenogram paralleled these clinical improvements. The abscess cavity in the upper lobe of the right lung, which originally measured

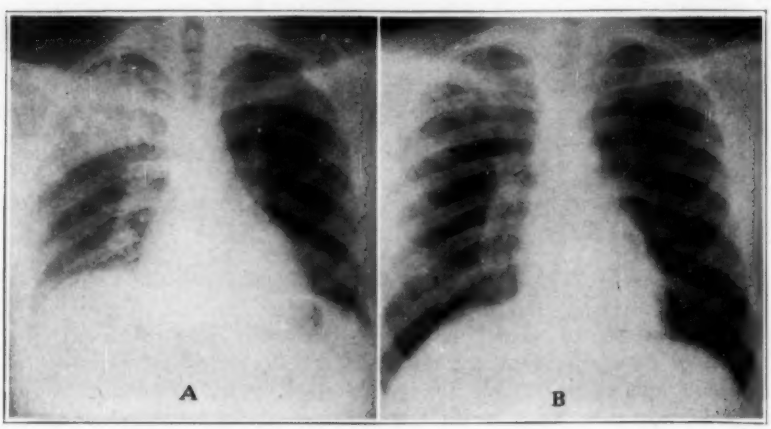

Fig. 1.—*A*, roentgenogram of abscess in upper lobe of right lung, six weeks after tonsillectomy; *B*, appearance after three weeks' medical treatment of rest in bed and postural and bronchoscopic drainage. Note almost complete disappearance of lesion.

approximately 3 cm. in diameter, surrounded by an area of increased density 7 cm. in diameter, gradually decreased until the roentgenogram taken on the thirty-fifth day showed only the slightest change, not 1 cm. in diameter, with no evidence of a cavity present.

As an example of some of the difficulties encountered in the chronic cases, I may cite the following instance.

A child, aged 8, had had tonsillectomy and circumcision performed under ether anesthesia three years prior to admission to the hospital. He remained in the hospital only one day after the operation, but during the weeks following his discharge, a fever of 105 F. developed, with abdominal pain. After six weeks, a diagnosis of pulmonary abscess was made. He was placed in bed in the sun for more than a year, and at the end of this time a severe bronchopneumonia developed, followed by an empyema necessitatis. By resection of the eighth rib, not

only was the empyema drained, but a large intrapulmonary abscess of the lower lobe was also drained. This lasted for about nine weeks, when the chest wound closed spontaneously. During the next two years there was expectoration of much foul sputum, and six months previous to admission signs of an abscess appeared in the upper lobe of the right lung. At the time of admission, the roentgenogram revealed two abscesses in the right lung, one in the upper lobe anteriorly and a large cavity in the lower lobe posteriorly (fig. 2). His tempera-

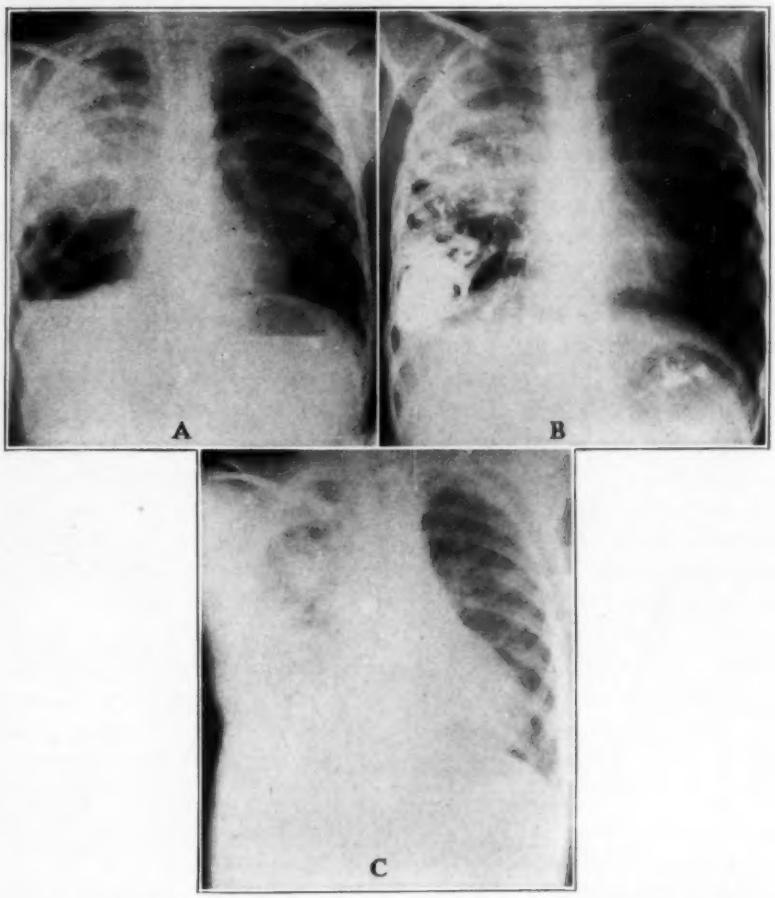

Fig. 2.—*A*, abscesses in upper and lower lobes following tonsillectomy three years previously. These large cavities with rigid walls can be obliterated only by extensive surgical procedures; *B*, cavities injected with iodized poppyseed oil 40 per cent, and *C*, appearance eight months later following phrenicectomy and multiple operations for resection of ribs.

ture during the first three weeks in the hospital ranged from 100 to 105 F., with a pulse rate of from 110 to 140 and respirations from 24 to 52. On March 1, the eighth rib was resected and the cavity in the lower lobe drained. On March 22, portions of the second and third ribs were removed anteriorly to drain the

abscess in the upper lobe. On May 10, the right phrenic nerve was resected to bring about elevation of the diaphragm and to assist in obliterating the cavity in the lower lobe. On May 14, a paravertebral thoracoplasty with resection of 8 cm. of the seventh, eighth, ninth and tenth ribs was performed, and on May 26, portions of the fifth, sixth and eleventh ribs were removed.

On August 13, the posterior abscess was uncovered by resection of the overlying ribs, and a skin flap was introduced into the cavity, leaving a large raw surface for subsequent skin grafting.

On November 5, according to the method of Butler, a large skin flap was elevated anteriorly and a large amount of necrotic pulmonary tissue removed with an aspirating tube from the abscess in the anterior part of the upper lobe.

In January the third, fourth, fifth and sixth ribs were resected anteriorly, and the middle lobe was exposed. It was found to be completely atelectatic with no areas of softening in it. This was done to rule out any suppurative process in the middle lobe, the exact condition of which had been unknown.

The child is progressing favorably with two bronchial fistulas, but sufficient collapse of the abscess cavities will probably not be effected until a complete thoracoplasty is performed on this side.

It is an axiom that an understanding of the physiologic processes underlying repair, as well as a consideration of the factors underlying the development of an intrapulmonary abscess, provides important foundations for the logic of certain therapeutic measures.

As to the development of an abscess, it may be stated that an intrapulmonary abscess is produced by the destruction and liquefaction of pulmonary tissue through the action of infecting organisms. These organisms may reach the lung by way of the bronchi or by way of the blood stream. If by the latter route, the offending embolus may be infected by one or more organisms. It is probable that the prompt healing of certain postoperative abscesses following a single effective evacuation into a bronchus may be explained on the basis of a blood-borne infection with one organism, and that this group provides the most favorable cases for medical care supplemented by one or two bronchoscopic treatments. It is true that such abscesses usually become secondarily infected once they have burst into a bronchus, but there is already a protective reaction present which may limit the process and prevent a more widespread destruction of pulmonary tissue. Van Allen [1] has shown that abscesses of the lung produced by *Staphylococcus aureus,* which are known to heal promptly and usually spontaneously, can be changed into a more chronic lesion by infecting the abscess secondarily with oral organisms by way of the bronchus. The difficulty of cure is correspondingly enhanced.

The second group of abscesses, a group in which surgeons are prone to include most of the postoperative abscesses, is the result of

1. Van Allen, C. M.; Adams, W. E., and Hrdina, L. S.: Bronchogenic Contamination in Embolic Abscess of the Lungs, Tr. Am. A. Thor. Surg. **19**:1262 (Dec.) 1929.

bronchogenic infection; these abscesses are usually due to the many organisms found in the mouth and pharynx and more particularly around carious and infected teeth. These organisms include the anaerobic and putrefactive bacteria, the streptococcal group, the vibrios, the spirochetes, *Bacillus fusiformis* and, as recently emphasized by Varney[2] of St. Louis, *Bacillus melaninogenicum*. Such abscesses are of much more serious import, because of the widespread destruction of pulmonary tissue, because of the multiplicity of organisms producing the inflammation and because of the varying degrees of virulence displayed by these organisms. The extent and spread of an inflammatory process may be determined by the extent of the thrombosis of the vessels leading to and from the site of inflammation, and it is probable that with a multiplicity of organisms present, there is a more extensive thrombosis of both pulmonary and bronchial vessels with consequently greater destruction of tissue. Such abscesses will not yield so promptly to simple treatment, and they are prone to develop into more chronic lesions.

Not only may intrapulmonary suppuration be produced by the aspiration of infected material and by infected emboli, but recent experiments[3] have shown that sterile emboli liberated in the blood stream may become secondarily infected from a coexisting or subsequent bacteriemia, and that the previously sterile embolic area breaks down with the formation of typical abscesses.

The following experiments may be cited:

ANIMAL K26.—The animal was killed fifteen days after the introduction of one infected and one sterile embolus into the jugular vein. The infected embolus lodged in the lower lobe of the left lung and produced numerous abscesses in the pulmonary tissue beyond it. The sterile embolus lodged in the lower lobe of the right lung, and the embolic area beyond it likewise showed multiple abscesses.

ANIMAL K59.—On February 25, an experimental cholecystectomy was performed following which the abdominal wound became infected. Only a draining sinus remained on March 13, when an exploratory laparotomy was performed by students. Again the wound became infected.

Twenty-eight days later, in the presence of two abdominal wounds draining a small amount of pus, two sterile emboli were introduced into the jugular vein. Pus continued to drain from the wounds until the animal was killed twenty-two days later. At necropsy in the deflated state, there was a small scar on the pleura of the lower lobe of the left lung underneath which a round, firm area, 1.5 cm. in diameter, could be felt. In the same lobe, a second smaller rounded firm area could be felt. After inflation, the lung appeared remarkably different (fig. 3). There was marked retraction of the lower lobe of the left lung with marked

2. Varney, Philip: Bacteria in Pulmonary Suppuration, Tr. Am. A. Thor. Surg., to be published.

3. Holman, E., and Mathes, M. E.: The Production of Intrapulmonary Suppuration by Secondary Infection of a Sterile Embolic Area: An Experimental Study, Tr. Am. A. Thor. Surg. **19**:1246 (Dec.) 1929.

diminution in its volume. It is evident that the true pathologic state of a lung cannot be determined by examination of the deflated lung only.

A roentgenogram showed both emboli in the lower lobe of the left lung with marked reaction about one of them. The bronchial artery leading to both emboli was markedly dilated, and the pulmonary artery beyond the emboli was not filled except for a slight injection in the region of the abscess through the bronchial artery.

The cut section revealed a small, irregular abscess cavity in which lay an embolus. Surrounding the cavity and extending to the visible depressed scar on the surface was a well defined area of consolidation. The second embolus was

Fig. 3.—Marked retraction of lower lobe of left lung containing an abscess produced beyond a sterile embolus introduced into the jugular vein in the presence of suppurating abdominal wounds.

encapsulated by fibrous tissue, but otherwise there was no pathologic change in the pulmonary tissue around it.

Animal R49.—This animal was received by the laboratory with a compound suppurating fracture of the left hind leg. Aside from the open wound of the leg, the dog seemed well. On March 7, two sterile emboli were introduced into the jugular vein. The dog was killed eight days later, and at necropsy, there was noted on the surface of the upper lobe of the left lung a deep red, softened area about 2 cm. in diameter. The second embolic area was not visible until the

lung was inflated, when it was disclosed in the lower lobe of the right lung by its paler color. The branches of the bronchial artery leading to the lobes containing the emboli were greatly dilated, and there was no filling of the pulmonary artery beyond either embolus (fig. 4).

The cut section of the upper lobe of the left lung showed an abscess cavity, 1.5 cm. in diameter, with a fairly thick wall surrounded by a limited pneumonitis. There was no pathologic change around the second embolus.

Whatever may be the origin of the infecting organism, whether by way of the blood stream or by the bronchi, the resulting destruction of pulmonary tissue leaves a dead space—the abscess cavity—which must

Fig. 4.—Pulmonary abscess surrounding a sterile embolus introduced into the jugular vein in the presence of a suppurating compound fracture of the leg.

be obliterated. The three important factors in the obliteration of the abscess cavity are: (1) adequate drainage, (2) the gradual contraction of fibrous tissue laid down as granulations in the wall forming the abscess and (3) the expansion of the healthy normal lung to replace the destroyed lung. Under certain conditions, the expansion of the lung to fill potential spaces in the thoracic cage is almost unbelievable. Working in the Hunterian Laboratory some years ago, I removed in three successive stages the entire lung on one side and one of the three lobes on the other side. The chest was filled by the remaining two lobes of the lung, and the animal led a perfectly normal existence.

This normal potential expansion of a lung is a most important factor in the obliteration of an abscess, but it may be greatly limited by several adverse conditions. Late recognition of the abscess and inadequate treatment resulting in a prolonged and chronic course may cause the deposition of so much fibrous tissue in the wall of the abscess that it becomes rigid and incompressible so far as the expansile force of the normal lung surrounding it is concerned. A cure under such circumstances is accomplished only by compression of the external wall of the chest through the extensive removal of ribs.

A second condition adverse to the expansion of the lung is an imperfectly drained abscess through a small bronchus or a constricted bronchus. When an abscess has a large, free opening into a bronchus but no external opening, the factors determining the expansion and distention of the lung operate as under normal conditions, and there is a constant tendency for the normally expanding lung to obliterate the cavity. The explanation probably lies in the fact that the normal lung is capable of much greater expansion than is affected by normal inspiration, but is limited in its expansion by the thoracic cage which it normally fills completely even in expiration. Because of this restricting action of the wall of the chest, the expanding lung in inspiration would have a tendency to obliterate any thin-walled cavity within it.

If, however, the abscess cavity cannot be easily emptied, owing to the small size of the opening into the bronchus, or if there is a constriction in the bronchus which is slightly open in inspiration only and closes down in expiration so that the contained pus and air are unable to escape when the wall of the chest is temporarily compressed, a situation exists in which during part of the respiratory cycle the pressure within the cavity exceeds the pressure without. The tendency to collapse during inspiration is counterbalanced by the tendency to expand during expiration, and the cavity is likely to remain stationary in size or even to grow larger.

Under such conditions, it is most necessary either to establish a free opening between the bronchus and the abscess cavity or to provide external drainage. The bronchoscopist may achieve it by the removal of granulation tissue, by the dilatation of a cicatrized bronchus and by the complete emptying of the cavity through suction so as to turn the tables in favor of the chief obliterating agent—the normal expanding force of the lung.

The most important factor, therefore, in the cure of an abscess is adequate drainage. If this is impossible through a bronchus, drainage through an opening in the wall of the chest is indicated. There are several reasons, however, why one should try to avoid external drainage, giving the bronchoscopist every opportunity before resorting to it. Pus and bronchial secretions which may continue to accumulate in the

bronchi around the abscess must be coughed up, but the expiratory effort necessary in effective coughing is rendered almost impossible by a large through-and-through passage produced by an external opening.

Other difficulties of healing arise in the presence of a large bronchial opening through the wall of the chest. The normal expanding power of the lobe containing the abscess is effectively reduced by the external opening. The marked reduction in vital capacity produced by a large bronchial fistula is indicative of the lessened expanding power of the lung. This point was recently illustrated in a patient who had worn a rubber tube in her side for eighteen months as a drain for a pulmonary abscess. When the lobe was removed subsequently, it was found almost completely shrunken and atelectatic through failure of alveolar exchange during the many months of the bronchial fistula. An external fistula in conjunction with an internal fistula, therefore, is an adverse factor to the obliteration of the abscess cavity by eliminating or reducing the expanding power of the normal lung surrounding the cavity. Every effort should be made to secure complete and adequate drainage of the abscess through the bronchus before introducing the embarrassment and impairment of normal alveolar exchange by an external fistula.

External drainage, of course, is mandatory when no opening or only a small opening into a bronchus exists. Under these circumstances, healing should be rapid since the normal expanding power of the intact pulmonary tissue is no more affected than when the abscess is drained through a large opening into a bronchus, and one may expect the same processes of fibrous contraction and expansion of pulmonary tissue to obliterate the cavity without great delay.

Recent experimental studies indicate that one of the important favorable factors in the healing of an abscess or suppurative condition within the lung is the double vascular supply consisting of the pulmonary artery and vein and the bronchial artery and vein. The latter artery branches from the intercostal arteries and carries, therefore, a systemic blood pressure as contrasted with the much lower blood pressure in the pulmonary system. According to Miller,[4] the bronchial artery supplies all the pulmonary tissue, including the alveolar septi, the bronchi and even the vasa vasorum of the pulmonary artery.

In connection with the experimental production of pulmonary abscesses by infected jugular emboli, it was found that the development of the abscess was accompanied by a remarkable dilatation of the bronchial artery leading to the lobe containing the infected embolus and the subsequent abscess.[8] This dilatation, though to much less marked

4. Miller, W. S.: The Arrangement of the Bronchial Vessels, Anat. Anz. **28**:432, 1906.

degree, occurred also in the bronchial artery leading to lobes containing sterile emboli. The dilatation was apparently greatly influenced by infection, and it is probably of considerable importance in limiting the extent of the infection and in promoting the healing process that follows (fig. 5). The remarkable recuperative powers of the lung in the face of widespread infection may be partly the result of this dual blood supply, and particularly the result of the dilatation of the bronchial artery leading to the site of infection.

It is obvious that if for some reason the infecting organisms should lodge in the bronchial artery or should produce a thrombosis of the bronchial artery as it lies in such close contact with the bronchus, there might occur destruction of pulmonary tissue of much greater extent than in the presence of an intact bronchial artery.

A most important deterrent to recovery and healing of intrapulmonary suppuration is the coexistence of a systemic disorder such as diabetes or renal incompetence. In the presence of diabetes the suppurative process in the lung behaves no differently than does a carbuncle elsewhere under similar circumstance, and even with the use of insulin the extension and progress of the inflammatory process is difficult and often impossible to control.

With reference to the actual surgical measures to be undertaken (only after adequate medical and bronchoscopic measures have failed), certain points need to be mentioned as of particular importance.

Accurate localization of the abscess by stereoscopic and lateral roentgen examination is imperative.

The needling of a probable intrapulmonary abscess without direct visualization of the abscess by resection of ribs is absolutely contraindicated. The danger of pleural infection in the absence of adhesions between parietal and visceral pleurae is obvious, and yet I recently saw in a prominent clinic the death of a patient who succumbed to a massive empyema following the intercostal aspiration of an intrapulmonary abscess.

If parietal and visceral pleurae are not adherent at the time the rib is resected, the wound must be packed with gauze approximating the two pleurae by pressure. Several days later the abscess may be opened by incising the pulmonary tissue with a black, not red cautery, so as to char the tissue slowly and seal the pulmonary veins against a possible fatal embolism of air or pus.

The number of ribs to be resected should be sufficient to permit rather extensive cauterization of the involved pulmonary tissue, a measure to be undertaken if necessary in two or more sittings. Care is necessary to avoid getting beyond the adherence of visceral and parietal pleurae, but wide cauterization is important in securing adequate

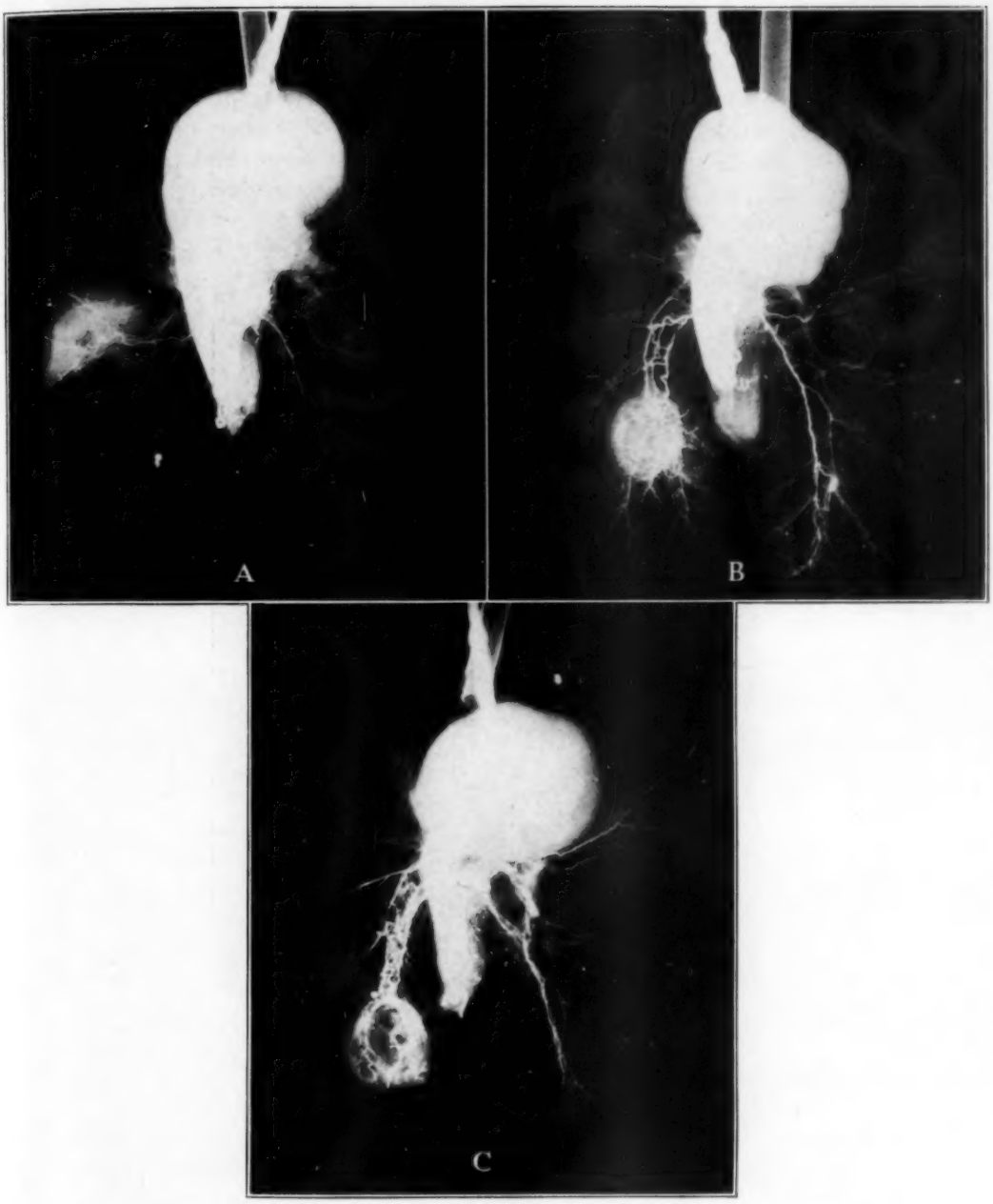

Fig. 5.—Injection of bronchial artery in presence of embolic pulmonary abscesses: *A*, four days after introduction of infected embolus; *B*, eight days after introduction of infected embolus, and *C*, thirty-one days after introduction of infected embolus, showing the marked dilatation of bronchial artery to lobe containing the abscess. The increased blood supply through the bronchial artery is undoubtedly an important factor in healing.

and sufficiently complete drainage of all the pockets of pus surrounding the main abscess.

The use of heavy rubber tubing as a means of drainage is absolutely contraindicated because of danger of injury to pulmonary tissue by contact with a hard inflexible object. Fatal hemorrhages and cerebral emboli have resulted from the use of rigid tubes for drainage. Instead the cavity is well packed with either gauze smeared with petrolatum or acriflavine gauze to serve as a bulwark against which the lung may find support during the expiratory effort of coughing. This is most

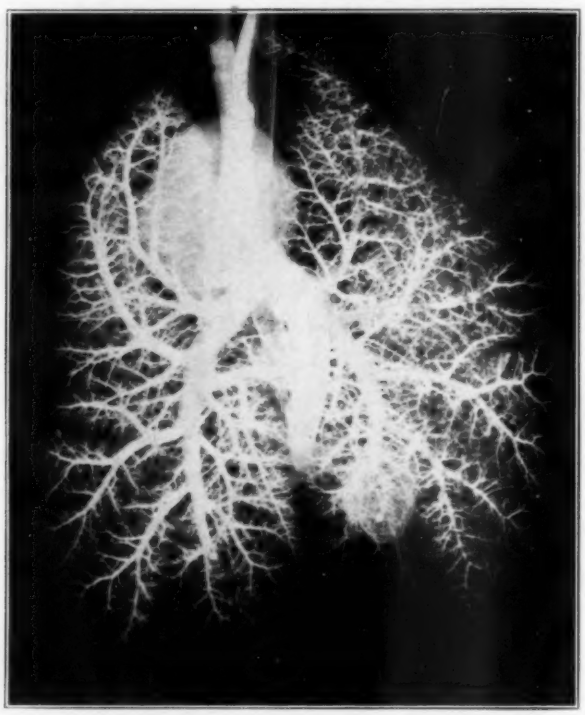

Fig. 6.—Injection of pulmonary artery in presence of an embolic pulmonary abscess showing complete cutting off of pulmonary artery beyond the embolus. (Same specimen as *B* in figure 5.)

important in the immediate postoperative period in order to avoid bronchogenic spread of the infection through the accumulation of pus in the bronchi surrounding the abscess.

Drainage should be accompanied also by absolute rest in bed, and by the usual supportive measures, until all evidence of the abscess, clinically and roentgenologically, has disappeared.

The residual bronchial fistulas may gradually close spontaneously, although healing may be accelerated by the repeated injections at

intervals of two or four days of a bismuth paste composed of 30 per cent bismuth subcarbonate in petrolatum. A large fistula which shows little sign of closing must be treated by mobilization of the surrounding pulmonary and fibrous tissue, by inversion of the bronchial opening, and by the resection of additional ribs overlying the cavity.

Large chronic abscesses with rigid noncompressible walls will require more extensive operations such as phrenicotomy, partial or even complete paravertebral thoracoplasty; on occasion, lobectomy may provide the only recourse when an entire lobe is riddled with multilocular abscesses. The method of choice in performing lobectomy is probably a combination of Archibald's principle of collapsing the wall of the chest so as to approximate the hilus and the chest wall and Whittemore's method of exteriorization of the lobe, with subsequent removal by repeated cauterization.

PULMONARY ABSCESS FOLLOWING TONSILLECTOMY

BRONCHOSCOPIC CONSIDERATIONS AS AN AID TO THE SURGEON *

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To be of aid to the thoracic surgeon the bronchoscopist must appreciate his problems and understand somewhat the principles of his surgery. I assume that today no thoracic surgeon works alone. I assume also that if he has not accepted Jackson's [1] plea for teamwork, he has paid heed to Willy Meyer's [2] endorsement:

> Let all remember that the best results with the least mortality can be obtained by teamwork only; that is, if bacteriologist, internist and surgeon, roentgenologist and bronchoscopist cooperate, often for weeks and months, for the welfare of the patient.

Therefore, when surgical intervention is indicated, the patient has had the benefit of all the accepted conservative methods of therapy. His treatment has been medicinal, climatic, dietetic and drainage—both postural and bronchoscopic—without improvement. Too often the patient seeks the surgeon as a last resort.

The first problem of the thoracic surgeon, then, is the location of the abscess, for location often determines the type of operation. He must know not only the lobe involved, but the location of the abscess within the lobe. He must know its relation to the pleura or to the lung root, its size, its shape and whether he has to deal with a single cavity or multiple abscesses, for he knows that abscesses of long duration are apt to be multiple.

It is essential to remember that every abscess of the lung, before it can be definitely diagnosed as an abscess, either roentgenologically or by physical signs, must have evacuated some of its contents, permitting some air to enter the cavity. It communicates, therefore, with the tracheobronchial tree. This communication may be circuitous; it may be imperfect, but it exists.

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* Submitted for publication, Nov. 18, 1929.

* Read at the Twelfth Annual Meeting of the American Bronchoscopic Society, July 6, 1929.

1. Jackson, Chevalier; Tucker, Gabriel; Clerf, Louis H.; Lukens, Robert M., and Moore, William F.: Bronchoscope as an Aid to the Thoracic Surgeon, J. A. M. A. **84**:97 (Jan. 10) 1925.

2. Meyer, Willy: Suppuration of the Lung: Surgical Aspect, Arch. Otolaryng. **7**:107 (Feb.) 1928.

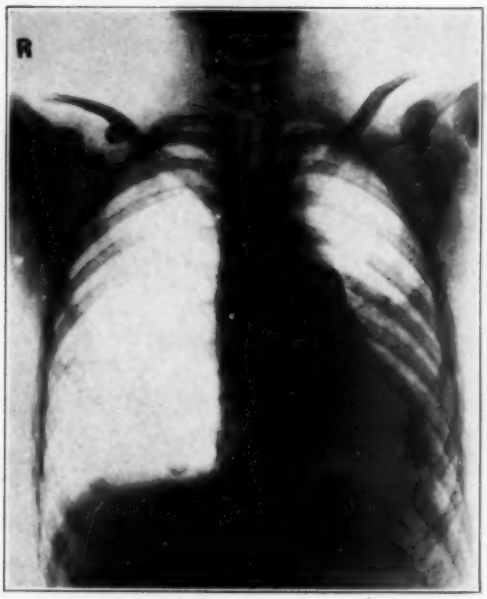

Fig. 1.—Y. V., aged 9: pulmonary abscess of the left lower lobe, following tonsillectomy. The bronchus was narrowed by granulations and after two bronchoscopies the bronchus was dilated sufficiently to obtain a pneumogram showing the abscess. Notice the fluid level.

Fig. 2.—M. L., aged 35: pulmonary abscess of the right middle lobe following tonsillectomy. The abscess was not reached by the iodized oil, due to bronchial obstruction.

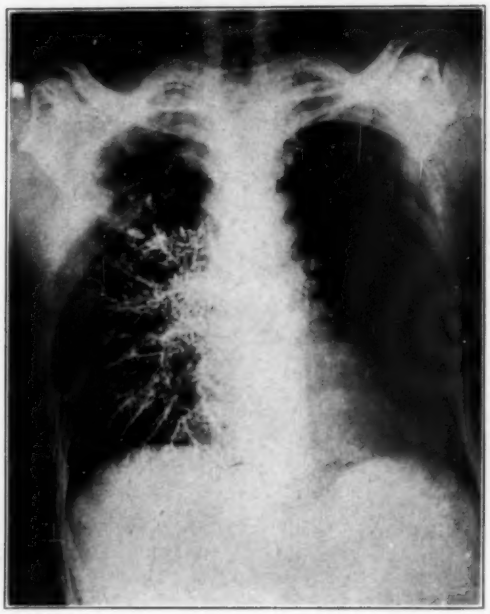

Fig. 3.—F. D., aged 36: pulmonary abscess of the right upper lobe. Normal lung is outlined, the iodized oil not reaching the abscess.

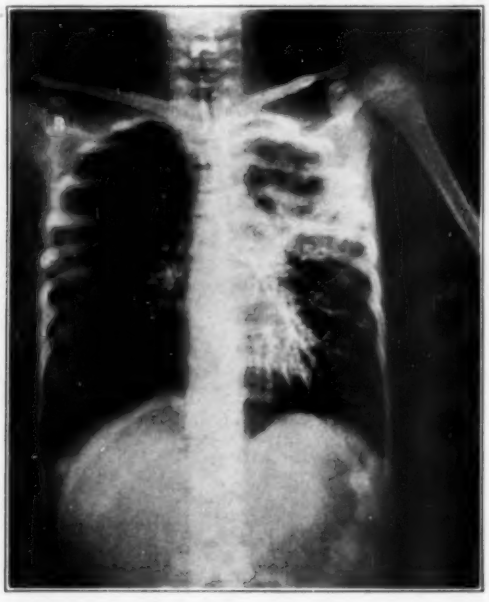

Fig. 4.—J. G., aged 10: pulmonary abscess of the left upper lobe following tonsillectomy. Normal lung around the abscess is outlined by pneumography. After an apicolysis there was a good recovery.

The bronchoscopist can aid in localization (1) by following the pus stream to its source, and (2) by pneumography. The difficulty in demonstrating abscess of the lung by pneumography is appreciated. Several years ago, Smyth and I [3] called attention to the error of interpreting "drowned lung" as abscess. To avoid this error, a fluid level or a "diagnosis by exclusion," that is, by outlining normal lung around the abscess, is demanded.

Of all the surgical procedures for abscess of the lung, improvement or cure depends on but two factors: drainage or massive removal. The success of collapsing operations, such as apicolysis, artificial pneumothorax and thoracoplasty, depends on the ability of the abscess to evacuate by way of the tracheobronchial tree. Of thoracotomy, Whittemore [4] said:

> This operation merely changes the direction of the drainage, and where the patient has been raising large quantities of pus by coughing, following the operation large quantities come through the drainage tube and will continue to do so as long as there is an open sinus.

Drainage is essential, and the bronchoscopist is justified in saying that he can aid the thoracic surgeon by securing the maximum bronchial drainage of the involved area. Drainage can be improved by the bronchoscopic removal of thick tenacious secretion, by the dilation of any stricture or strictures that may exist and by the removal of any granulation tissue that is tending to obstruct the bronchus.

In certain cases, the bronchoscopist can aid the surgeon by finding the abscess with the bronchoscope, and, by leaving it in situ, permit the surgeon to open the abscess by cutting down on the bronchoscope. Both Clerf [5] and Kernan [6] reported having rendered this aid to the surgeon.

CONCLUSIONS

1. The bronchoscopist is of aid to the thoracic surgeon in localization of the abscess (1) by following the pus stream to its source and (2) by pneumography.

2. The bronchoscopist can improve drainage by the dilation of strictures and by the removal of granulation tissue that may be obstructing the bronchus.

3. In certain cases, bronchoscopic sounding permits the surgeon to open the abscess by cutting down on the bronchoscope.

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3. Smyth, D. C., and Schall, L. A.: Pneumography by Lipiodol: Its Present Uses and Limitations, Ann. Otol. Rhin. & Laryng. **36**:1134 (Dec.) 1927.

4. Whittemore, Wyman: The Treatment of Chronic Broncho-Pulmonary Suppurative Lesions Limited to One Lobe of the Lung, New England J. Med. **199**:1213 (Dec. 13) 1928.

5. Shallow, Thomas; and Clerf, L. H.: Proc. Philadelphia Acad. Surg., 1924.

6. Kernan, Jr., John: Tr. Am. Bronchoscopic Soc., 1927, p. 133.

EXTERNAL OPERATION ON THE FRONTAL SINUS*

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I present this small series of twelve cases because there is no operation in the domain of rhinology around which so much controversy has raged as the external operation on the frontal sinus. There is no operation which has been productive of so much disappointment and discouragement, no operation which has been fraught with so much repulsive physical deformity. It is also attended with great danger to life. The value of this operation is still in the balance, and therefore I feel that every time it is performed the results should be reported in careful detail. The apparent successes, the discouraging failures, the sad fatalities should be brought to light so that discriminating men may carefully piece together a complete technic which will give at once the safest and most efficient method of attack on chronic empyema of the frontal sinus.

In the cases presented here, with one exception, the operation was performed by the same method. It is known in the literature as the Jansen-Ritter, the Knapp and the Lynch method. While I hold no brief for Dr. Lynch, and while he says himself that his operative technic is not original, but is made up of bits of technic adapted from the work of various men, the fact remains that Dr. Lynch set out clearly each step of his technic and advanced sound and convincing reasons for each procedure, so that it is easy to follow him and get the same results.

There are those who can recall with what enthusiasm the first reports of Killian's operation were received, and as he continued to report successes how the enthusiasm grew. When he was the honored guest of the section at Atlantic City in 1907, he was hailed as a conqueror. I will never forget seeing the old man on the board-walk returning from a banquet, wearing a chaplet of leaves on his head and sitting on top of the world! In Philadelphia he demonstrated his operation on the cadaver before several hundred enthusiastic rhinologists. As to the cosmetic effects of his operation, he was not so sure. In answer to a question, he shrugged his shoulders and said, "Eet is not ze operation for ze young ladies!" He swept along with success and growing con-

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* Read before the Section on Laryngology, Otology and Rhinology at the Eightieth Annual Session of the American Medical Association, Portland, Ore., July 10, 1929.

fidence through eighty-five operations and then came three fatalities in succession. Reports of recurrences followed. The cases of resulting deformity were disturbing. Also, the relatively large number of fatalities in the hands of other men made one pause. Then came the discouraging conclusion that the Killian operation had not solved the problem. Where are now the operators who were once so enthusiastic over the Killian operation? Few reports are seen of operations done after the Killian method. What then has been learned from the vast experience of the ablest surgeons who have sought to solve this problem? For one thing a hydra-headed monster is being dealt with whose resourcefulness taxes the best skill. When one thinks that he is killed, one finds that he is only scotched, and that he raises his grisly head elsewhere.

It may be of interest to trace briefly down to the present day the course of operative procedure adopted by surgeons. In the beginning there were no rhinologists, and the anatomy of the paranasal sinuses was poorly understood. The general surgeon thought only of drainage, and that externally. In the successful cases, the cavity was trephined and packed for months perhaps until the cavity was obliterated by granulation. Some of the bright surgeons attempted to divert the drainage into the nose by passing a probe through the nasofrontal duct or by breaking away part of the medial and inferior wall. Sometimes drains were introduced, irrigations were practiced together with the use of cauterizing medicaments. However, the frontal sinus was not touched except in case of manifest empyema, such as tumors, fistulas, abscess, etc. All those cases of empyema were ignored which were not manifested by external symptoms. As late as 1887 at the Berlin Medical Congress it was agreed that the frontal sinus should not be opened except in the presence of rupture, pressure on the bulb or intracranial symptoms. It was increasingly noted that the simple trephine operation resulted in few permanent cures. If the mucous membrane had become permanently diseased, recurrence followed with abscess and fistula formation. It then began to be advocated that the diseased mucous membrane should be curetted out. In 1885, Ogston [1] advanced his method which was afterward supplemented by Luc. The method consisted of an incision along the orbital edge and downward toward the root of the nose. The frontal sinus was opened to the outside of the median line, the size of the opening being proportional to the size of the cavity. Curettage of the cavity was performed and the anterior ethmoid cells were broken down and free communication established between the sinus and the nasal cavity. A drainage tube was introduced from the

1. Ogston: Brit. M. J., May 23, 1885.

floor of the frontal sinus into the nose, and the external wound closed at once. Luc later used iodoform gauze for drainage material.

In 1890, Nebinger [2] published an article on the operative handling of frontal sinus disease in which practically the same operative technic was advocated except that drainage was provided for externally at the angle formed by the horizontal and vertical incision.

By this time surgeons appreciated the necessity of removal of diseased mucous membrane and the desirability of intranasal drainage. They had not yet given consideration to the cosmetic effect. They were working for a cure and appearances were secondary. The method of Kuhnt,[3] reported in 1895, was the most radical of all. According to his technic a horizontal incision along the supra-orbital margin is joined

Fig. 1.—R. H. O., operated on May 19, 1924. The patient had pansinusitis. All other sinuses were opened and drained previous to the external operation. The frontal sinuses were very large, extending to external angles on each side and up to the hair line. The left frontal sinus drained into the right through a fistulous opening in the interfrontal septum discovered at operation. The interfrontal septum was removed and both frontals were curetted through the operative opening in the floor of the right frontal sinus.

The photograph of the patient was made in 1929. There was no pus or crusting in the nostrils.

by a vertical incision at the inner angle of the eyebrow. The entire anterior wall of the frontal sinus is removed and the contents thoroughly curetted out. When any involvement of the floor of the sinus was present, the floor was also removed. This is the first reference to the removal of the floor of the sinus. On account of its radical procedure, cure was obtained in many cases by complete obliteration of the sinus.

2. Nebinger: Dissertation, Erlangen, 1890.
3. Kuhnt: Weisbaden, 1895.

Its weak points were the ignoring of the diseased ethmoid cells, the long period required for healing and the resulting deformity. Luc [4] frequently operated according to this method by adding to it curettage of the ethmoid cells and enlargement of the nasofrontal duct. Lermoyez also operated in a similar way. In 1894, Jansen [5] took the first step toward cosmetic effect by preserving the anterior wall of the sinus and removing the floor. This method also was a great advantage in curetting the ethmoid cells. This was, however, not a hard and fast rule with Jansen as he sometimes removed the entire anterior wall when he found it diseased. In 1906, Ritter [6] modified Jansen's method by removing a portion of the anterior wall in order to be able to inspect the cavity more advantageously.

Riedel,[7] in 1898, advocated the most radical of all procedures by removing the entire anterior wall, the floor of the sinus and the ascending process of the anterior maxilla together with the removal of the anterior ethmoid cells. Hajek said that this is the most likely of all operations to effect a cure; but that the horrible deformity resulting is the serious drawback.

This review of operative technic brings one again to the period of Killian.[8] Surgeons now recognized that it was necessary to destroy all diseased mucous membrane and to deal radically with bone involvement, and that it was necessary to have a wide opening into the nose. To this end the anterior ethmoid cells were removed, the nasofrontal duct enlarged and as large an opening as possible secured into the nose. To this end also the entire anterior wall of the frontal sinus, the entire floor of the frontal sinus, together with the ascending process of the superior maxilla, were removed. This attack is typified in the operation of Riedel, and is the most radical of all operations on the frontal sinus. It gives the best possible access to all the recesses of the frontal sinus, and if the diseased mucous membrane and diseased bone is not eradicated it is the fault of the operator's technic and not of the operation. What was it then that was detrimental in this operation? It was, of course, the hideous deformity. In view of this, Killian came forward with an operation designed to secure all these benefits without the resulting deformity. In the *Archives für Laryngologie und Rhinologie*, 1902, he described his operation.

The Killian operation calls for the entire removal of the anterior and inferior wall of the frontal sinus. His attempt to avoid disfigurement is by the retention of the orbital ridge. The frontal process of

4. Luc: Arch. internat. de laryngol. otol. rhinol., no. 27.
5. Jansen, B.: Arch. f. Laryngol. u. Rhinol., 1894, vol. 2.
6. Ritter: Monatschr. f. Ohrenh., 1906.
7. Riedel: Dissertation, Jena, 1898.
8. Killian: Arch. f. Laryngol. u. Rhinol., 1902, vol. 13.

the superior maxilla is resected as in the Riedel operation, thereby giving wide access to the diseased ethmoid cells. A wide communication is assured between the frontal sinus and the nose. The steps of the operation are in a curvilinear incision extending from the outer border of the sinus, as disclosed by a roentgenogram, through the eyebrow down the side of the nose to about the level of the lower bony border of the orbit. Hemorrhage is controlled by hemostats left on until the operation is finished. No ligatures are applied for fear of getting catgut infection. The periosteum is elevated above the incision to correspond to the size of the anterior wall of the sinus. The sinus is opened at its lower anterior border and the whole anterior wall is removed. The diseased mucous membrane is thoroughly removed with a sharp curet. This constitutes the first step of the operation. The second step is the

Fig. 2.—Miss C. W., operated on Jan. 6, 1925, for closed empyema. The photograph was made in 1929. No pus or crusting was noted in the nostrils.

formation of the bridge. The soft parts are elevated over the orbital ridge, but the periosteum is left so that necrosis of the ridge may not follow. An incision is then made through the periosteum along the lower border of the orbital ridge outlining the bridge. This incision extends along the lower border of the ridge until it joins the first incision. The soft parts and periosteum are elevated over the frontal process and toward the inner and upper wall of the orbit to the insertion of the trochlear. Killian was very insistent on not separating the tendinous attachment of the muscle for fear of causing diplopia. The orbital roof is then carefully removed, caution being necessary to avoid injury to the orbital contents and the brain.

The next step is the removal of the ascending process of the superior maxilla. This gives access to the ethmoid cells which may be curetted easily from this exposure. After removal of the ethmoid cells, the

sphenoid may be curetted. After this stage, Killian constructed a mucous membrane flap from the nasal mucous membrane. This was difficult and time-consuming, and it has been shown that it is of no particular benefit. The next step is the introduction of a thick drainage tube down into the nose and a smaller one externally in the lateral end of the wound. The external tube is removed in two or three days, and

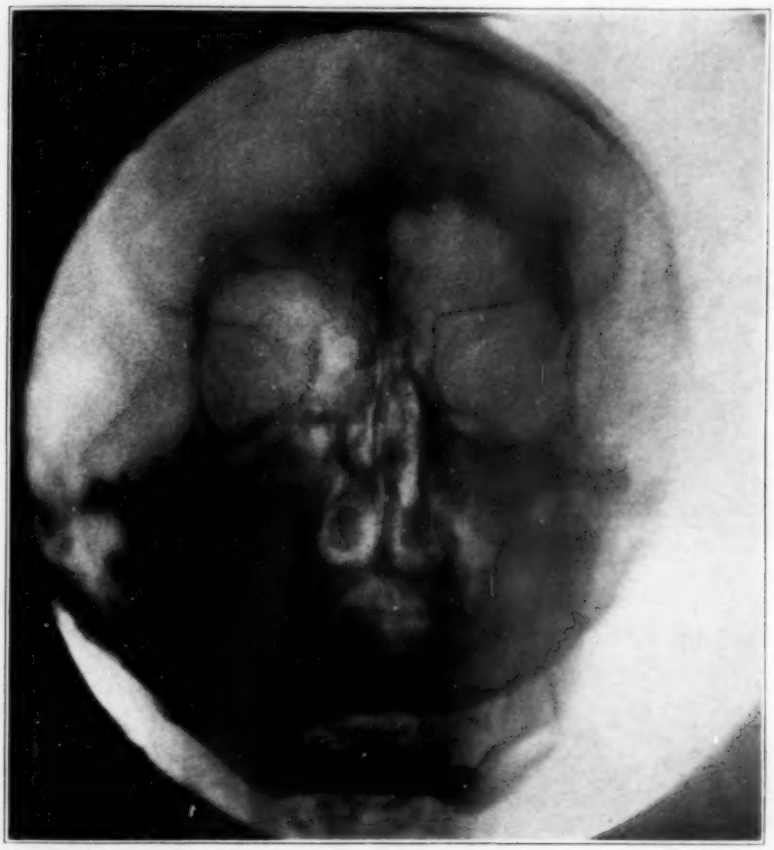

Fig. 3.—The greater part of the floor of the left frontal sinus was destroyed by necrosis. Necrosis of the posterior wall exposed an area of the dura as large as a twenty-five cent piece.

the inner one in about eight days. The wound is covered with a light compression bandage.

In 1899, Knapp [9] described an operation and published the report of a case. The essential features of his operative technic consisted in the preservation of the anterior wall, the removal of the floor of the

9. Knapp, A.: Arch. Ophth. **18**:50, 1899.

sinus and the total removal of the ethmoid cells. He gives credit for his technic to Jansen.

The operation of Lothrop had quite a vogue for a time and is still practiced by a number of men. No doubt many patients have been cured by the use of his technic, but I confess that I am deterred from using it by my hesitation about opening up a perfectly healthy sinus. His theory that epithelialization will take place from the healthy sinus into the operative one is to my mind wholly unnecessary. A frontal sinus on which operation has been performed and which has had all its mucous membrane curetted out, does not heal by epithelialization, but fills with organized granulation tissue.

I have gone over the ground covered by surgeons in their efforts to effect a cure of this disease. As far back as the time of Riedel, this problem was solved. It was found that a cure could be effected by eradicating all diseased tissue including that in the ethmoid and sphenoid sinuses. What was it that kept men from taking advantage of the knowledge which had taken so long to acquire? The hideous deformity was the specter that stalked the surgeon and stayed his hand. The surgeons knew the cure, but the price was too great to pay. From the time of Riedel the problem was to get his results without the deformity. There are those who still say that it cannot be done. Hajek insisted that all the recesses of the sinus cannot be cleaned out without removing a portion of the anterior wall. As late as 1927 Dr. Mithoefer said, in a paper before this section, that when a surgeon begins to think about cosmetic effect, he endangers the success of his operation. I believe just as firmly that it is possible for the surgeon to think primarily of cosmetic effect and at the same time to achieve success.

What is the ideal for which surgeons have been consciously or unconsciously working? First, it is to free the patient of his disease; second, to avoid deformity; third, to shorten as much as possible the period of convalescence, and fourth, to lessen the danger to life. Now if anything has been learned, it has been learned from Riedel that one cannot assure cure of empyema of the frontal sinus without destroying all diseased tissue. Then if one is to have a cure without deformity, all diseased tissue must be removed through the floor of the frontal sinus without disturbing the anterior wall. Hajek and other writers to the contrary, I have found this entirely possible in the eleven cases in which I have operated. Some of these patients had very large frontal sinuses extending to the external angle and up to the hair line. With properly curved curets, every angle of the sinus could be reached and the diseased membrane removed.

My study of the literature and my practical experience in twelve cases lead me to form certain conclusions in regard to the external

operation on the frontal sinus. First, I think it is eminently a three-stage operation. In practically all cases, in addition to the frontal empyema, there is empyema of the ethmoid, sphenoid and maxillary sinuses. Do not be in too much of a hurry. Take plenty of time to clear up the antrum and ethmoid. As the drainage from the ethmoid, the sphenoid and the antrum decreases, the patient's general condition improves. The resistance for the final operation is greater and there

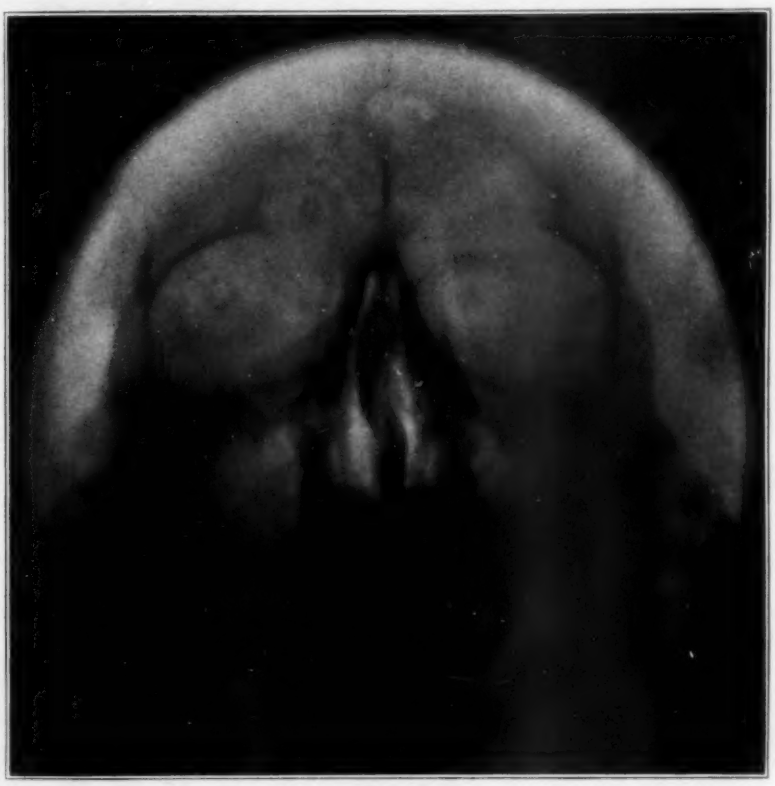

Fig. 4.—Roentgenogram of C. W., operated on July 22, 1926. An interesting feature of this case is that both the right and the left frontal sinuses empty into the left nostril. As can be seen, the interfrontal septum is squarely in the center. The right nasofrontal duct passed over into the left nostril at about the level of the roof-cells of the ethmoid. The left frontal sinus has been operated on externally and the operative defect can be seen in the floor of the left sinus. The right frontal sinus was operated on later.

is less to do. Thus the operation is shortened, the shock is curtailed and the area from which infection might arise is lessened. Operate on the antrum first; then in a few weeks, on the ethmoid and the sphenoid. Do as complete an exenteration of the ethmoid as it is possible to do

intranasally; then in a few weeks do the external operation. It can be done quickly with a minimum amount of trauma and shock.

The bugbear of the external operation on the frontal sinus is recurrence. There are, of course, many factors that may be responsible for this. But in the present day when the operation on the frontal sinus is better understood than ever before, I think there are three factors that interfere with the success of the operation. First, failure to remove entirely the floor of the sinus makes it difficult to remove all the diseased membrane. Niches and angles are left behind where the diseased membrane is harbored and overlooked and the result is a recrudescense of the infection. The other two factors, to my mind, are responsible for most of the recurrences, namely, failure to deal adequately with the paper plate and failure to deal thoroughly with the ethmoid labyrinth. The whole success of the operation depends on a wide drainage area into the nose. The last paper on this subject read before this section was by Dr. Mithoefer, and I think it is legitimate to discuss his conclusions. He advised removal of only as much of the floor as is necessary, and his illustrations indicated that he left a certain portion of the floor. He further warned against removing much of the paper plate. He said that if a paper plate is extensively removed there is danger that the orbital fat will prolapse into the nose and close off the drainage space. There are practical dangers, and there are theoretical dangers. I think this is decidedly a theoretical danger. In the cases I have had, there has not been the slightest indication of a prolapse of the orbital fat, and I have made it a point to remove all the paper plate possible. Lynch does the same thing and in his large series of cases, he has made no mention of such a thing. Dr. Mithoefer, in common with other men, speaks of saving the middle turbinate bone. This is another thing to which I cannot subscribe. After the ethmoid has been exenterated, I cannot see the good of trying to save the middle turbinate. My belief is that it should be thoroughly and completely removed at the time of the preliminary ethmoidectomy. The statement that removal of the middle turbinate is followed by crusting is not borne out by the facts. Crusting did not occur in any of my cases. I think, rather, that crusting is an indication that some of the infected ethmoid cells have been overlooked, or that there is diseased tissue left in the frontal or the sphenoid sinus. To my mind, a middle turbinate left behind is only an additional obstruction to drainage and a possible hindrance to a complete exenteration of the ethmoid labyrinth. In recapitulation, therefore, I believe that the greatest cause of recurrence is failure to remove the floor of the sinus completely, failure to remove the paper plate and failure to remove all ethmoid cells and the middle turbinate.

I was somewhat puzzled by one of the causes listed by Dr. Mithoefer as a reason for postoperative retention; namely, the removal of too much of the mucous membrane of the posterior wall of the ductus

nasofrontalis. Of course, there is no ductus nasofrontalis after the complete removal of the ethmoid cells and the floor of the sinus, as one can easily see by looking at the specimen. How could one insert a half inch drainage tube if any part of the ductus nasofrontalis had been preserved? I remove the ductus nasofrontalis together with all its mucous membrane and make a new and greatly enlarged one.

In this series of twelve cases, I noted some points that were of great interest to me. The first one that I shall take up is the question of involvement of the bone. There were three cases in which necrosis of the bone was found. In two cases there was fistula formation, together with necrosis of the posterior wall. In one case, the dura was exposed over an area about as large as a half dollar. A good part of

Fig. 5.—C. H. F., who had an external operation done on the right frontal sinus on April 21, 1928. In nine months, the patient had had one external operation and nine intranasal operations.

the posterior wall was gone. In the other, the area was a little larger than a quarter of a dollar. In the third case, there was a fistulous opening between the left and the right frontal sinus.

There was one point in common between all three cases; namely, there was no drainage into the nose in any of them. In one case a bony tumor had been removed externally from the antrum and ethmoid region by Dr. Crile. The depressed scar which followed resulted in complete obstruction of the drainage system of the frontal sinus. The first indication of frontal abscess was fistula formation in the floor of the sinus, and operation disclosed necrosis of the posterior wall. In another case, the first indication of pus in the frontal sinus was disclosed by fistula formation in the orbital roof and orbital cellulitis. In the third case, the fistulous communication between the left and

right frontal sinuses was found at operation. This leads me to think that the bone is not likely to be attacked by necrosis in empyema of the frontal sinus unless there is complete obstruction to drainage. There was one case of gangrene of the mucous membrane. The entire mucous membrane was a grayish black and bathed in a dark ichorous discharge.

Fig. 6.—Roentgenogram showing ethmoid cells entirely out of the reach of the intranasal operative technic; also showing why it was not possible to establish drainage by means of an intranasal operation.

The membrane slipped from the periosteum easily and was dislodged without effort. This patient gave a history of unilateral headache over a period of several years. When she consulted me, there was no discharge in the nose, and there was none during the period that I watched her. A roentgenogram disclosed the condition of the sinus, but it was several months before she would consent to an operation.

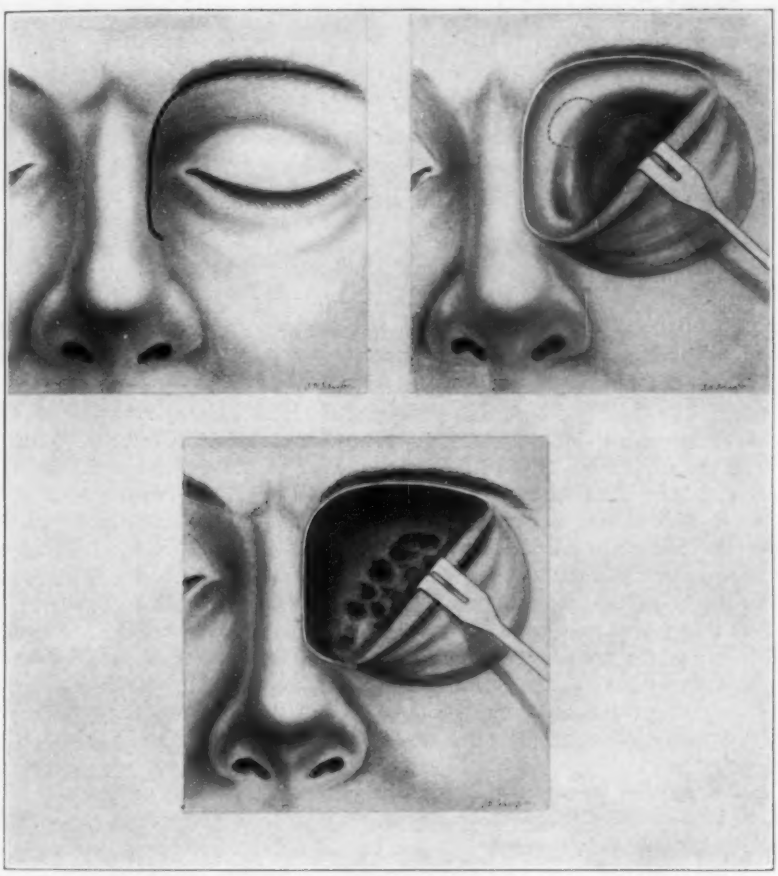

Fig. 7.—The first figure shows the line of the skin incision. The next shows the elevation of the soft parts. Note that the periosteum is not elevated above the line of incision. This is a point insisted on by Dr. Lynch. Elevation of the periosteum above the line of incision is not necessary to the technic and increases the danger of osteomyelitis. In the lower figure it is seen that the entire floor of the frontal sinus has been removed to the uttermost recesses and the mucous membrane of the rest of the sinus has been carefully curetted away. The paper plate together with all remaining ethmoid cells has been completely removed. In order to do this thoroughly it is necessary to remove the nasal process of the superior maxilla, the lower lateral edge of the nasal bone and the lacrimal bone.

The same condition was operating in this case as in the case of bony necrosis, and no doubt the necrosis of the mucous membrane would have been followed by necrosis of the bone.

Hajek devoted considerable space to the discussion of empyema of the frontal sinus, uncomplicated by involvement of other sinuses. To my mind, a discussion of this kind is more or less academic. No case of chronic empyema that I have ever had was isolated, and I can hardly visualize a case of chronic empyema of the frontal sinus that would not involve at least the ethmoid on that side. In fact, I have had only one case that did not show involvement of the antrum on the same side, and I have the feeling that involvement of the ethmoid, sphenoid and antrum on the same side is the rule.

TECHNIC OF THE EXTERNAL OPERATION [10]

The teeth and gums are inspected and are painted with iodine at the time of operation. The nose is swabbed out with a 50 per cent solution of iodine. The face is prepared in the usual way with iodine and alcohol; the entire face to the lips is painted on both sides and wiped off with alcohol. A postnasal plug is inserted. The brow is not shaved, and a pad of gauze is placed over the eye. The incision is the usual Killian incision through the eyebrow and down the side of the nose to about the lower level of the bony orbit. The hemorrhage, which is rather profuse, is controlled with artery forceps, and they are left in place, as I try to get along with as few ligations of the vessels as possible for fear of catgut infection. For this reason, I use mosquito forceps.

Now comes an important step of the operation. The periosteum is elevated only below the line of incision. The anterior wall of the frontal sinus is not touched. This is a very important point for two reasons. It does away with the deformity, and it lessens the danger of osteomyelitis. Here is one of the distinctive features of the Lynch technic. The periosteum is elevated with great care from the floor of the frontal sinus and over the nasal bone. I use an ordinary submucous elevator for this part of the operation. Great care must be exercised in elevating the periosteum around the lacrimal sac. There is no need to pay any attention to the attachment of the superior oblique muscle, except that the periosteum should not be buttonholed. When the periosteum has been elevated carefully over the whole field, I make an entrance to the frontal sinus at the inner angle with a gouge and mallet. I then explore the frontal sinus with a probe to determine its extent.

Now comes another important step in the operation. The floor of the frontal sinus is removed completely with biting forceps, and there must be absolutely no recesses left. The granulation and the diseased mucous membrane is curetted away with the utmost care. A curved curet is best for this. It might be well at this point to comment on a criticism that has been made by Hajek and others; namely, that it is not possible to curet the frontal sinus completely without attacking the anterior wall. I have had some very large sinuses extending over to the external angle and up to the hair line and I have been able to clean them thoroughly through the floor. In one case at operation I found a sinus extending from the left frontal into the right frontal sinus. I removed the septum between the two and curetted the left sinus thoroughly through the opening into the right

10. Lynch: Laryngoscope **31**:1 (Jan.) 1921.

with perfect success. When the diseased mucous membrane is thoroughly curetted out, the frontal sinus is packed with gauze soaked with iodine.

The next step is also an important part of the operation. I remove the nasal process of the superior maxilla, the lower lateral edge of the nasal bone, the lacrimal bone and the entire paper plate. In removing the paper plate and the external bone ethmoid cells are encountered that I have been unable to remove intranasally. I am able to make a clean sweep and to get rid of the diseased bone at the inner angle of the brow or orbital recess which it seems to me is overlooked in the usual Killian operation. By the removal of the paper plate and the remaining ethmoid cells, I find a large opening down into the nose through which I introduce a half inch drainage tube from above and bring it out the nose. It is my custom to insert a small rubber tube inside the large tube which gives the tube a certain stiffness that makes it easier to insert. The small inner tube is removed the following morning and keeps the large tube from getting obstructed with blood clot. Two deep catgut sutures are now taken in the depths of the wound and anchored not to the periosteum above but through the muscle and skin, the point being not to introduce any avenue for infection into the periosteum of the upper part of the wound. The external wound is closed with Michel skin clips. The eye is flushed with 20 per cent mild silver protein, covered freely with sterile petrolatum and a generous gauze dressing and a pressure bandage is applied. The following morning, the small tube is removed, alcohol is dropped into the large tube and a large sterile piston syringe is used to suck it back through the tube. It is surprising how much secretion this will bring out in the way of blood clot and detritus. This will keep the tube open for drainage. The purulent discharge disappears at once and does not recur. This dressing is performed each morning for from eight to ten days; then the drainage tube is removed, and the patient is to all intents and purposes well. You will notice that there is no irrigation of the wound at any time as is advised by many operators, nor is there any irrigation afterward. I think such a procedure is uncalled for and is dangerous.

ABSTRACT OF DISCUSSION

Dr. Wilson Johnston, Portland, Ore.: We are not agreed as to the best type of operation for the frontal sinus. We are gradually becoming well crystallized as to the cause of our failures, that being the failure to remove the nasal frontal ethmoid cells, failure to remove completely the diseased mucous membrane, and failure of the enlarged nasal frontal duct to remain patent. I have no quarrel with Dr. Cullom as to his method of approach in his operation. As I look back over my own cases I find that nature tries to teach us that the approach through the floor is her method. In the majority of cases of orbital cellulitis we find the roof of the orbit or the floor of the frontal sinus perforated. That was the condition in the first frontal sinus on which I operated, and in approaching that I followed the path nature had shown me and removed the floor. I was able to use a curet and to remove the diseased mucous membrane, enlarging the opening into the nose somewhat. The whole cavity was packed externally, and the patient was cured.

Dr. Cullom says he can and does remove all of the mucous membrane through an opening in the floor. I am sure that in the twelve cases reported he has not had a case like one I had recently in which in the frontal sinus the space between the two plates was not more than a millimeter, and it was necessary to remove the external plate in order to remove the diseased mucous membrane. I think the majority of us will agree that it is very difficult, if we are going to remove all of the mucous membrane and remove it thoroughly, to do so from below, because

there are recesses and ridges that make it almost impossible. It is, therefore, my procedure to remove the floor and as much of the paper plate as I can, then remove the anterior ethmoid cells, and after I have outlined the frontal sinus, to go to the upper border and open through the frontal plate, remove one-quarter inch completely around the upper border so that I can then remove all of the ridges and all of the mucous membrane above. Little deformity results from removal of the bone and the procedure permits me to be sure that I have removed all of the mucous membrane, which I consider is the most important part of the operation. Dr. Cullom said that he removed diseased bone and exposed the brain membranes. I cannot see how any surgeon has the temerity to do that and then close up the frontal sinus wound. We do not do it in operations on the mastoids when we expose the meninges, and there we have a greater opportunity for drainage than we have in the frontal sinus. I am more and more convinced that the operation that will give us the greatest number of cures is an operation similar to that used by Dr. Cullom—the operation that gives complete removal of the diseased ethmoid cells, of the diseased mucous membrane, and then allows for external packing for the obliteration of the frontal sinus cavity.

Dr. Ross Hall Skillern, Philadelphia: It is most interesting to hear Dr. Cullom gives a résumé of some of the older operations, because it was just at that time that I began to be interested in laryngology, around 1900. I recall well the controversies at that time and how everyone stood his own ground and seemed to take sides in the discussion. Coming to the operation he has described, of course, we all know that it originated with Jansen of Berlin in the late nineties, was later taken up by others, and finally Dr. Lynch modified it and removed many of the dangers so that now it very deservedly bears his name. Dr. Cullom said: "First of all, I think it is manifestly a three-stage operation." I am sorry that I cannot agree with him. I think it may be a two-stage operation, but usually when a patient comes to us someone else has already performed the first stage. In some cases the maxillary sinus is not involved, and if it were, a couple of needle punctures would clear up the involvement. So it seems to me that this operation is one on which we must concentrate and make sure that it is the infection in the frontal sinus that is causing the symptoms, and that that is the location to which we must give surgical attention.

Dr. Cullom said further: "There are three factors that interfere with the success of the operation. First, failure to remove the floor of the sinus entirely." I presume he means in this particular operation, for certainly in operations in general we do not disturb the floor of the sinus unless we are compelled to do so. Then he speaks about the whole success of the operation depending on a wide area of drainage into the nose. I think there he is wise. I believe that a great deal of the success of our external operating on the frontal sinus is due to the wide opening we get afterward, although it is not drainage that counts as much as ventilation. If we get thorough ventilation, if the air circulates well through these parts—frontal, ethmoid and maxillary sinuses—our chances of ultimate success will be much better than if we depend on drainage alone.

Another thing I wish to endorse unreservedly, is what Dr. Cullom says about the removal of the middle turbinate bone after the ethmoid has been exenterated. I do not see why it is necessary to preserve a structure of which none of us know the exact function. You may say because it helps to warm the air. Perhaps it does; but what does the inferior turbinate do? I think we can easily get rid of the middle turbinate without hurting the patient. Therefore, to be on the safe side I feel it is better to get rid of this structure entirely, as it does interfere with drainage and most certainly it interferes with aeration. I have never seen a case in which harm came from removing the middle turbinate.

Regarding the operation itself. We have two indications for operation on the frontal sinus—one absolute and one relative; one of choice and one of necessity. Our operation of choice is the Lothrop method, which is modified so that we do not take out the large part of the nasal septum, and make a small opening: we do, however, make a large opening into the nose. This may also be the operation of necessity; this depends on the amount of bone involvement. If considerable of the bone is involved near the eye and the orbital plate, of course, it has to be removed. So the operation which Dr. Cullom recommends comes in well for one of necessity, rather than one of choice, but after all it is the final results that count. In the final analysis it matters little what we do, but how we do it. After we have done the external operation it depends on the results. It is not the special technic, but rather the results obtained that concern the patient.

Dr. Arthur C. Jones, Boise, Idaho: I hardly feel that I can have a one type operation for all frontal sinus infections. The type of pathologic process I find in the sinuses, the roentgen observations, the character of the discharge and the physical condition of the patient help me to decide on how extensive the operation will be in order to give my patient relief. As to the number of stages in the operation, I rarely see a patient until he has been operated on at least once, but if I am fortunate enough to see him before he has had any operation I generally use two stages. I do not recall seeing any case of infection of the frontal sinus in which there had not been at least an infection of the ethmoid and most generally an infection of the antrum. In the first stage, that is, the operation on the antrum, I do not do a simple puncture as suggested by Dr. Skillern. I find it necessary to do a radical operation. In checking over my cases of operations on the antrum over a period of five years, I find that the patients who have had radical operations are much freer from recurring infection and persistent discharge than those who have been treated more conservatively. Extensive ethmoid infections are handled much more satisfactorily when an external operation is done. In regard to cleaning out the paper-thin bone, I have never seen any indications of the orbital fat extending into the nose and shutting off the drainage. I want to congratulate Dr. Cullom on the excellent results he has secured by this method. Perhaps some of the operations I have been doing have not been done carefully enough. For the past six years I have been doing all my operations under local anesthesia. It certainly lessens the amount of bleeding at the time of operation, and when it is possible, instead of using a curet I do a subperiosteal elevation and remove the entire mucous membrane in one piece. I feel much more certain that I have not left any isolated bits of diseased epithelium in the antrum. This can be done much easier by using a local anesthetic.

Dr. R. H. T. Mann, Texarkana, Texas: It is indeed strange that so much confusion still exists regarding the proper operative procedure to be taken in sinus infections. Sinus operations should, and as a matter of fact do, result in cures in as large a percentage of cases as other operations, when a correct diagnosis has been made and the operation suited to that particular case has been performed. An open or radical operation should be performed in all except acute cases. If a thorough inspection has been made and all the diseased tissue has been removed and free intranasal drainage established, a cure is uniformly to be expected. In discussing with Professor Killian many years ago the cause of failure in such a large percentage of cases following his operation when performed by other surgeons, and giving such uniformly good results when done by himself, he said there was not more than one operator in fifty who was fully cognizant of the technic of his operation. I have been a student of Killian's—that was when he first devised his operation—and since that time I have uniformly

employed a modified Killian operation in these cases. It has been as successful as any other operation, and there has been practically no mortality following the operation. I think a thorough exenteration and cleaning out should be done, and I am sure when that has been done that many less failures will occur in operations on the frontal sinus than are now being reported.

Dr. John F. Barnhill, Miami Beach, Fla.: This paper has brought out many points which are still controversial. Both paper and discussions have also brought forward the fact that no one operation is suitable to all cases. With our modern means of finding out the nature and extent of the pathologic process in the sinus and how extensive the disease is, we are usually able to determine beforehand with a good deal of precision what operation is most suitable. In the days before the Killian operation became as well known as it is now, operations on the frontal sinus were often successful because in performing the Kuhnt operation the frontal wall was taken away. All the pathologic process was removed, and the sinus was then packed daily until healing by granulation occurred. This required about three months, and the scar was often unsightly. I occasionally see one of these patients on whom I operated more than twenty years ago. They remain well even if unfortunately they bear a scar. Since Killian came to America and demonstrated his operation I have adopted it in suitable cases and have found it satisfactory in well selected instances.

I agree with Dr. Skillern that the anterior wall of the sinus, in case the cavity is large, must be removed if one is to be sure that the operation is being done that will result in cure, for the upper angle where the two tables of the skull come together is frequently so narrow that it would be absolutely impossible to remove all the disease which lies in this narrow space except by an operation which removes the entire frontal wall. It occurred to me as Dr. Cullom showed his pictures that in his particular cases it would have been wholly impossible to remove the mucosa from the upper angles of the sinuses as successfully as he must have done by any type of operation which did not remove the anterior wall.

Just two things are necessary for success in any operation on a septic, noncollapsable cavity. The first is to remove all of the pathologic process. The second is to secure adequate drainage then and afterward until healing has taken place. Dr. Skillern said that ventilation does great good. That is true for the very fact that air enters the cavity freely is an indication that there is also ample provision for necessary drainage.

Dr. Robert C. Lynch, New Orleans: Referring to conditions of the frontal sinus, when I read my first paper the first sentence was, "after all else has failed, try this." That little sentence covers a multitude of sins, and I think does away with the necessity of one, two or three-stage operations. If the antrum is diseased, it should be taken care of first and by the various methods which are our property—irrigation or radical operation. The patients that we operate on for conditions of the frontal sinus have an infected antrum and an infected ethmoid and sphenoid as well. Many of them have been operated on before, and the pathologic process is so definite and characteristic that diet, sunlight and constitutional medication, and cell habitation that has been spoken of in the last two or three weeks, will not restore the normal condition. If operation on the antrum is done instead of on the ethmoids, clean out the antrum as much as possible and open the sphenoid sinus. The idea is to get rid of as much membrane as possible and do it thoroughly. If the membrane is not gotten rid of completely, crusting will occur after the operation, and crusting is an evidence of incomplete operation.

Dr. Barnhill and Dr. Skillern and some of the other men spoke of drainage and ventilation after operation. I do not think either drainage or ventilation is

necessary or of any consequence. I have not found one sinus in which it is not possible to reach the apex, that is, the point between the frontal plate of the frontal sinus and the partition that forms the outer wall of the anterior cerebral cavity or the posterior wall of the frontal sinus. When that whole floor is taken away, and it extends up to the hair line, see that these two plates are anatomically separated. In those cases, the sinus is large. A long narrow projecting sinus with only 1 mm. difference between the anterior and the posterior wall, so far as I know, has never been exhibited in any of the anatomic specimens which I have seen or of which pictures have been exhibited. I do not think it exists. The larger the sinus the greater the separation, and the greater the separation the easier the removal. When the sinus is smaller the removal is proportionately easy. It cannot be done with a large curet; the instrument must be adapted to the work in hand. After the walls of the ethmoid and sphenoid cells are removed, there is nothing to drain, there is nothing to ventilate. Insert a small rubber tube, not over one-half inch in size or less than one-quarter inch, and a no. 16 catheter is all that is used. Leave it in not more than three days, and then let the patient alone.

DR. M. M. CULLOM: Dr. Johnston spoke of having a sinus with 1 mm. between the plates. I have not found that. Of course, if such a condition should be encountered, and the anterior plate is removed, there would not be much resulting deformity. One has to deal with each case as it occurs.

Dr. Johnston spoke of the danger of exposing the dura. I did not expose the dura. Nature did that. There was necrosis of the posterior wall and I merely freshened the edges of the necrotic area where nature had already exposed the dura. I do not think there is the least danger in leaving a condition of this kind. There is wide drainage and nature is only too glad to seal this place if the pus is given a chance to get out some other way. Nature is only trying to find an outlet for the pus that is pent up.

I am much in accord with Dr. Lynch's last remark about the thoroughness of the operation. I think a thorough operation is far safer than a partial one. In the case I spoke of in which the young man had had nine intranasal operations and one external operation, I did a complete external operation. The patient was a very sick boy and had a temperature of 103 F. Some of my surgical friends advised me to open the sinus externally and to make no attempt to curet. My belief was that it was far safer to clean out all the diseased tissue and get thorough drainage than to make a partial effort and leave so much disease behind.

Dr. Lynch deprecates the use of a large drainage tube as unnecessary. I bow to his greater experience and allow that a small drainage tube left in for only three days may be sufficient, but I cannot help feeling that as large a drainage tube as one can insert left in for a week or ten days is safer and more rational. The pressure of the tube discourages the springing up of granulation, and I think insures a larger drainage opening for a longer period.

I am much in accord with Dr. Skillern's remarks. He was very kind, and I think we are in agreement on almost all points. The main point is to get rid of all the diseased tissue. I was especially pleased at his strong endorsement of the complete removal of the middle turbinate. In this series of cases, three patients developed cellulitis. Some of my surgical friends said, "Open these sinuses and see what is the trouble." My reply was, "What do you expect to find when you open them?" All diseased tissue has been thoroughly removed, and I think we would accomplish nothing by opening them; besides it would be highly dangerous to open up the wound in the presence of cellulitis.

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RHINOPLASTY

FACTS AND FICTION *

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NEW YORK

This paper is prompted by the desire to stimulate discussion to focus attention on a subject that has hitherto been regarded by the medical profession with mystified reverence, open derision or frank apathy.

This material is presented, not from the point of view of the rhinoplastic surgeon, but from that of the rhinologist who considers rhinoplastic surgery a part of his work. It is confined to intranasal procedures for the correction of nasal deformities.

HISTORIC BACKGROUND

The history of surgical procedures for nasal deformities is relatively younger than that concerned with nasal construction.[1] As early as 1848, von Dieffenbach mentioned nasal shortening in his "Operative Surgery." He cited two instances—one in which he corrected the ala nasi in a large nose and another in which he dealt with the reduction in a large but apparently normal nose—corrected through a cross incision of the skin and cartilage. His methods, however, were subsequently forgotten.

In 1887, John Roe, an American, reported the successful correction of a pug-nose. For such cases, he resorted to the removal of superfluous tissue; in cases of too broad nasal tips, he incised the ala nasi at different places and then used a saddle apparatus. In 1892, Robert Weir, also an American, reported the correction of an overly prominent nose. However, most of these subcutaneous corrective operations were hardly satisfactory.

All this work was soon forgotten, nor did it leave any permanent impression on the European literature. Certainly, up to 1898 no description of nasal surgical procedures for reductive or constructive purposes is recorded. In 1898, Jacques Joseph, unaware of the previously mentioned authors, performed by his own method an operation in which

* Submitted for publication, July 10, 1929.

* Read before the Section on Laryngology, Otology and Rhinology at the Eightieth Annual Session of the American Medical Association, Portland, Ore., July 12, 1929.

1. Joseph, J.: Korrective Nasen und Ohrenplastic, in Katz, L., and Blumenfeld, F.: Handbuch der speziellen Chirurgie des Ohres und der oberen Luftwege, Leipzig, Curt Kabitzach, 1921, pp. 261-262, vol. 1.

a nasal hump was reduced and the tip was shortened and made narrower. He accomplished this by removing a portion of the septum just underneath the hump, then fracturing the attachment of the nasal and maxillary bones and pressing in the nasal ridge. In 1902, Joseph reported a case in which he corrected an abnormally forward protruding cartilage (the so-called potato-nose).

Neudorfer, in 1903, reported an extranasal subcutaneous hump reduction; Nelaton and Ombredanne, of Paris, cited two Americans, Smith and Monks, who in 1895 and 1898 carried out similar operations. In 1904, Joseph described the intranasal hump reduction (performed without touching the external skin), and in a further publication described the narrowing of the bony nose, as well as the reduction of the large protruding septum. In 1905, he described the operation for shortening the nose without external scar formation and in 1907 the narrowing of the nasal tip through intranasal band excision. In 1910, at the gathering of the German Society for Natural and Medical Sciences, he described further improvements in the scarless shortening of the nose through decortication and removal of skin, as well as corrections of skin disfigurement of the ala nasi and the nasal tips.

THE STATUS QUO

Although rhinoplasty was practiced as early as the middle of the fifteenth century, the greatest impetus was given to this work by the World War. Its relative newness and comparatively spectacular achievements inevitably led to a great deal of public attention. The press, exploiting the purely sensational angle, devotes considerable space to each popular personage who has submitted to surgical operations changing the shape of his nose. Large and profusely illustrated articles in Sunday editions describe in great, if erroneous and exaggerated, detail the work of the "plastic surgeon," with particular emphasis on sensational aspects as being of the greatest "news value." The general awe in which the laity regard the miracle men capable of performing such wonderful operations, without scarring the face, has extended even to some members of the medical profession.

The very name "plastic surgery" is a popular error. If the term plastic signifies "that which tends to build up tissue," the current phrase is a misnomer when used in reference to intranasal methods. "Cosmetic surgery" is the more accurate name, and "'plastic surgery" should rightfully be reserved for treatment resulting in rebuilding an organ partly or completely lost.

Cosmetic surgery, then, is within the province of the competent rhinologist,[2] despite the fact that the correction of nasal deformities

2. Israel, S.: External Deformities of the Nose and Their Correction by Intranasal Route, South. M. J. **15**:326, 1920; Texas State J. Med. **17**:304, 1920.

has long been his bugbear. Those most familiar with the anatomy, physiology and pathology of the nose and paranasal sinuses, and those possessing proper medical background, should get the best results. The actual operative technic is not nearly so complicated as one is led to believe. Moreover, postoperative results can be fairly accurately visual-

Fig. 1 (case 6).—Front view of plaster of paris cast model before operation.

Fig. 2.—Same as figure 1, but showing deformity corrected on model.

ized by preliminary work on plaster of paris models and photographs of the patients (figs. 1, 2, 3 and 4).

To be sure, perusal of the literature on the subject leaves one rather confused. Contradictory statements are made, and descriptions are not always lucid. A few examples will serve to illustrate this point. For instance, Sheehan [3] favored the columella incision as preferable to the

3. Sheehan, J. E.: Plastic Surgery of the Nose, New York, Paul B. Hoeber, Inc., 1925, p. 7.

intranasal, because it prevents infection and favors greater ease in the introduction of the instruments.

Gillies [4] recommended the columellar lift. Roberts [5] preferred his horizontal incision at the tip of the nose. Frank and Straus [6] spoke enthusiastically of their modified intercanthal operation. Lewis [7] described a vertical incision in the lower half of the columna nasi. Tieck,[8] in describing a new method, recommended the following: "A second incision beginning at the inferior part of the lower edge of the nasal bone, at the junction of the vomer is made." The discrepancy between this description and the actual anatomic facts is indeed puzzling. Hunt,[9] in his book, presented a photograph of a patient

Figure 3

Figure 4

Fig. 3.—Same as figure 1, lateral view.

Fig. 4.—Same as figure 2, lateral view.

labeled "hump nose operation by author's method," but search fails to reveal a description of his procedure. Davis [10] found cartilage trans-

4. Gillies, H. D.: Plastic Surgery of the Face, Oxford Medical Publications, 1920.

5. Roberts, S. E.: Nasal Hump, Ann. Otol. Rhin. & Laryng. **33**:1251, 1924.

6. Frank, I., and Straus, S. J.: An Invisible Scar Method in Cosmetic Nasal Surgery, Ann. Otol. Rhin. & Laryng. **30**:670, 1921.

7. Lewis, J. D.: External Nasal Deformities, Laryngoscope **32**:214 and 217, 1922.

8. Tieck, A. J. E.: A New Method for the Correction of Nasal Deformities by Intranasal Procedure, Author's reprint, 1919, p. 3.

9. Hunt, H. L.: Plastic and Cosmetic Surgery of the Head, Face and Neck, Philadelphia, Lea & Febiger, 1926, pp. 234 and 235.

10. Davis, J. S.: Plastic Surgery: Its Pinacle and Practice, Philadelphia, P. Blakiston's Son & Company, 1919, p. 462.

plants most satisfactory; Hunt [9] pointed out all the disadvantages of this medium and recommended the use of the patient's middle turbinate instead. Israel [11] saw no wisdom or need in sacrificing a normally functioning turbinate when cartilage is so readily accessible and is superior in withstanding infection.

QUALIFICATIONS OF THE COSMETIC SURGEON

Bettman [12] expressed the belief that the surgeon requires a certain amount of artistic judgment. Carter [13] insisted that "the work requires a modicum of artistic talent, a God-given attribute distributed not to all who are called but only to those that are chosen."

Berne [14] stated that "the artist's vision is just as essential to the surgeon who would excel in rhinoplasty as it is to the sculptor; even more so than to the painter, who deals, in the last analysis, with flat surfaces only." Unquestionably, these gifts are of great help. But without embarking on a discussion of contemporary esthetic theories, I may point out that one is dealing with living tissues, a medium which is vastly dierent from the sculptor's clay. Even in the best of hands postoperative results may prove disappointing, because of the contracting of scars, bony exostoses, the failure of the transplant to take or its curling. This is readily evident from the comparison of a photograph taken shortly before with one taken some time after the operation.

I believe that a rhinologist with a fair understanding of configuration and symmetry should obtain satisfactory results, particularly with the aid of preliminary work on plaster of paris casts.

The methods described in the literature are hard to comprehend and harder to follow, and the numerous drawings which accompany these descriptions are not of any great help. This statement refers particularly to the intranasal methods, although some exception should be made of Salinger's [15] paper. Marshall [16] offered an adequate description, yet his technic requires an external incision of the skin.

In a majority of cases, narrowing of the bridge of the nose is essential to secure good results. The English literature which I have encountered does not give a satisfactory exposition of this procedure.

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11. Israel, S.: Correction of External Nasal Deformities, Ann. Otol. Rhin. & Laryng. **32**:506, 1923.

12. Bettman, A. G.: Plastic Surgery of the Nose, Med. J. & Rec. **123**:499, 1926.

13. Carter, W. W.: Correction of Nasal Deformities, New York State J. Med. **25**:1070, 1925.

14. Berne, Louis P.: Modern Conceps of the Correction of Deformities of the Nose by Intranasal Methods, Internat. J. Surg. **34**:344, 1921.

15. Salinger, S.: Surgical Correction of Crooked Noses, Illinois M. J. **54**:368, 1928.

16. Marshall, G. M.: Correction of Nasal Deformities, J. A. M. A. **60**:179 (Jan. 18) 1913.

Therefore (although this paper was not intended to describe technic), I should like to avail myself of the opportunity to present these very important drawings of Professor Joseph[17] and a brief description of his method (figs. 5 and 6). (Details of asepsis and anesthesia are omitted.)

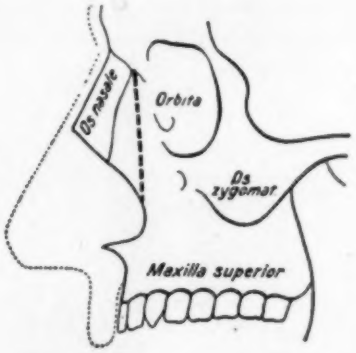

Fig. 5.—Narrowing of the bony nose. The dotted line gives direction and beginning of intranasal sawing. (After J. Joseph.)

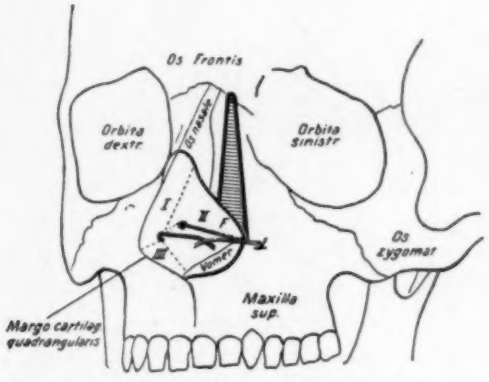

Fig. 6.—Correction of the bony and cartilaginous portions of a bent nose. Schematic oblique view of the skull in region of the quadrilateral cartilage. *L* indicates openings in superior maxilla through which a thread is passed and is attached to the cartilaginous septum; *F*, site and extent of the superior maxilla resection for the correction of bent nose. (After J. Joseph.)

A transverse incision about 1 cm. long is made within the nose at the inferior edge of the upper lateral cartilage (cartilagi nasi

17. Passaw and Claus: Operationen am Gehörorgan an den Tonsillen und in der Nase, ed. 2, Leipzig, Ambrosius Barth, 1923. Cohen, Lee: Corrective Rhinoplasty, Laryngoscope **24**:565, 1914.

laterales) at the junction with the cartilage of the septum. With a Joseph submucous elevator, the skin and the periosteum are carefully elevated. Another incision is made at the extreme lower end of the pyroformis opening on both sides. The periosteum is freed from the bone, from the lower external end of the pyroformis opening to the radix nasi and the bone is sawed with a knee-shaped Joseph saw, through the processus frontalis of the maxilla on both sides. The freed portion of the bone is bent toward the median line for the purpose of narrowing the bridge of the nose.

A personal visit to the various clinics where this work is done gives little more satisfaction. My experience, in a post-graduate course abroad, indicated that the practice of the methods taught there would be most diastrous to a living patient. The teacher, in this particular

Fig. 7 (case 1).—*A*, before operation; *B*, after operation.

instance, discussed modifications of the Joseph method, but in a private conversation, he admitted that he was not familiar with the Joseph technic.

REPORT OF CASES

In his routine practice, the average rhinologist is occasionally confronted with problems necessitating his familiarity with corrective processes.

Case 1 (fig. 7).—A. C., a boy, aged 16, presented himself at the clinic stating that two weeks previously he was hit with a bat. The immediate effects were inconsequential. For the past week he had complained of absolute obstruction to breathing. It did not yield to the ordinary home remedies. Examination revealed the mucous membranes of the lower part of the septum widely separated, and fluctuation was elicited.

A diagnosis of septal abscess of traumatic origin was made. The family was told of the situation and also warned that evacuation of the pus would probably result in a depressed nasal bridge, because treatment was too long delayed. In spite of this warning, the family hinted, subsequent to the operation, that the surgical intervention was responsible for the deformity.

Three months later, with the patient under general anesthesia, a part of the seventh rib was inserted into the nose. Although the transplant did not take, there was apparently enough scar tissue formed to cure the deformity.

Not infrequently, restorations of the normal functions of the nose cannot be accomplished without correction of the nasal deformity as well.

Case 2 (fig. 8).—In K. A., aged 35, a submucous resection, double ethmoidectomy and removal of posterior tips of inferior turbinates was performed to relieve obstructed nasal breathing. But not until the tip of his nose was shortened, thus enlarging the vestibule, was the desired result obtained.[18]

Case 3 (fig. 9).—J. T., a youth, aged 20, gave a history of nasal trauma resulting in lateral nasal deflection to the left of the entire nose, including the septum.

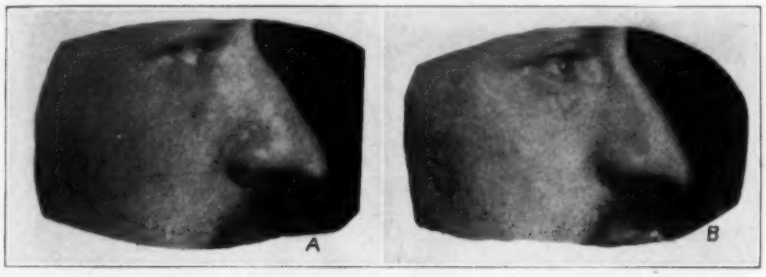

Fig. 8 (case 2).—*A*, before operation; *B*, after operation.

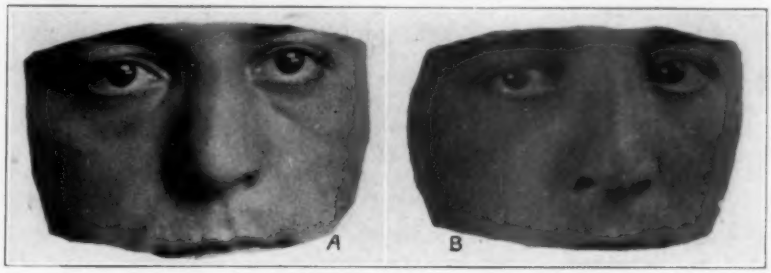

Fig. 9 (case 3).—*A*, before operation; *B*, after operation.

While he was chiefly interested in good breathing, this could not be attained unless the nose was restored to its original position, which was accomplished by breaking the old fracture and restoring the nose to normal.

Case 4 (fig. 10).—J. P., a man, presented a history and complaint similar to the patient in case 3. (The Gillies operation was employed here.)

Case 5 (figs. 11 and 12).—L. S., a girl, a student, aged 17, complained of collapse of the ala nasi at each effort of inspiration. She also had an unsightly, flat nose of the negroid type, which made her very unhappy. Her deformity was somewhat exaggerated after I performed a submucous resection. After narrowing the bridge of the nose and using a piece of the cartilage of the helix of her ear, a very satisfactory result was obtained, both cosmetically and functionally.

18. Blanchard, H. B.: Corrective Rhinoplasty, Rhode Island M. J. **9**:162, 1926.

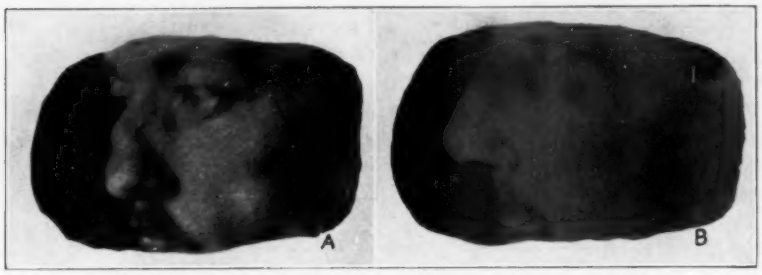

Fig. 10 (case 4).—*A*, before operation; *B*, after operation.

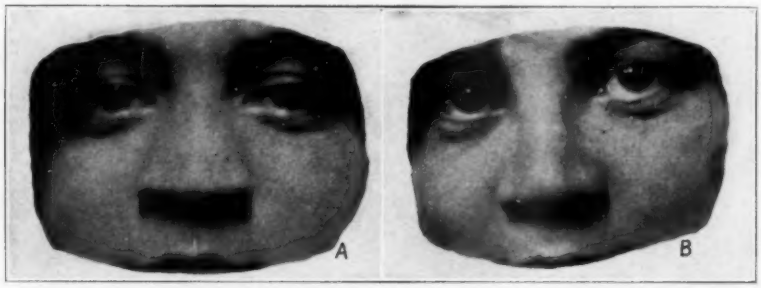

Fig. 11 (case 5).—*A*, before operation; *B*, after operation; front view.

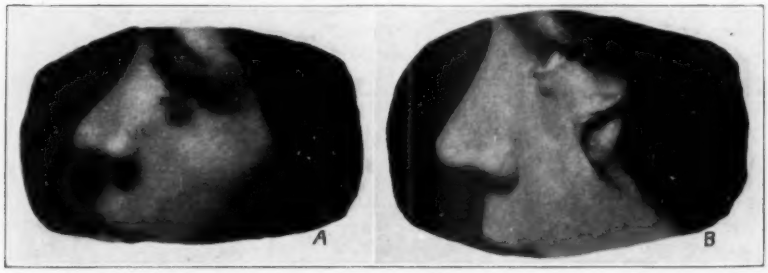

Fig. 12 (case 5).—*A*, before operation; *B*, after operation; lateral view.

CASE 6 (fig. 13).—M. M., a medical student, aged 21, sought relief because he was very conscious of his bulky nose and was convinced that it would be an absolute detriment to his future career.

He consulted another surgeon who advised insertion of transplant. Preliminary work on a plastic model convinced me that removal of tissue and narrowing of the nose, rather than adding to it, were necessary. This procedure was then carried out with good results.

CASE 7 (fig. 14).—K. H., a nurse, was operated on, her physical deformity and the postoperative results being shown in figure 14.

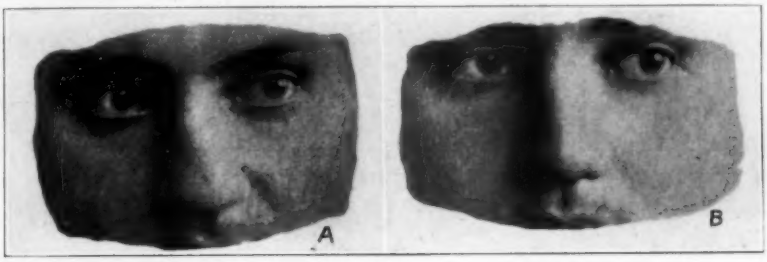

Fig. 13 (case 6).—*A*, before operation; *B*, after operation.

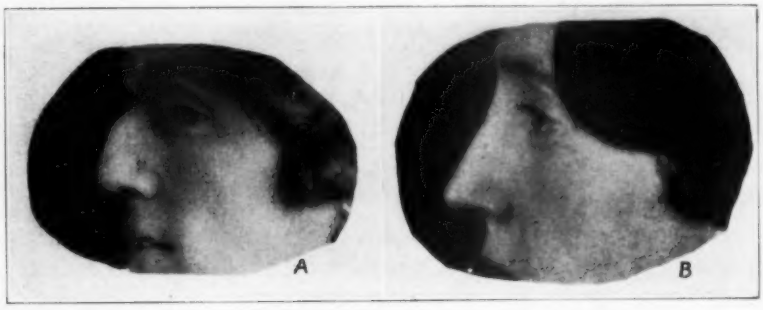

Fig. 14 (case 7).—*A*, before operation; *B*, after operation.

Even those who do not approve of cosmetic surgery cannot deny that the patients in cases 1, 2, 3, 5 and 7 were entitled to earnest attention and best efforts for relief.[19]

Fear of infection scares a good many from this type of work. When one makes sure of the absence of either local or systemic disease and then employs aseptic technic, which includes gentle handling of the tissues, the occurrence of infection should be very exceptional.[20] When infection occurs, it should be drained immediately through the original point of incision.

19. Smith, Ferris: Surgical Treatment of Saddle Nose and Malignancies, J. Michigan M. Soc. **20**:414, 1921.

20. Cohen, Lee: Nasal Deformities, J. A. M. A. **67**:1663 (Dec. 2) 1916.

LAWSUITS

In these ultramodern days when patients have recourse to the courts of justice on the slightest provocation, the possibility is well worth bearing in mind in undertaking a surgical procedure, more especially in cosmetic surgery. I know of no foolproof means of evading this unpleasant development. However, having so far managed to avoid courts and even threats of lawsuits, I can offer the following suggestions:

1. Avoid operating in cases of minor nasal deformities. The greater the pathologic process, the better is the chance for a satisfied patient.[21] Even 75 per cent improvement will be appreciated.

2. Avoid a whiner who projects all his or her misfortunes of life on a slight nasal deformity. A great deal of annoyance will be saved by letting a more ambitious colleague operate.

3. Never operate without a previous photograph. Many a patient forgets what he looked like before an operation.

4. Use a model before operating. When in doubt, additional work on a cadaver will help.

5. Send the patient to a hospital.

6. Be reasonably sure that the patient is not suffering from any local or systemic disease.

7. Do not promise the patient too much. Leave room for pleasant disappointment.

8. Warn the patient that in some instances more than one operation is necessary to secure the best results.

9. It is always safer to do a little less than too much. Many a good result has been sacrificed by too radical surgical measures at the first sitting.

COMMENTS

Unquestionably, cosmetic operations have a decided effect on the functions of the nose in a large number of cases. In most instances, however, the operation is undertaken with a purely decorative purpose. It might readily be argued that the former partake of the nature of necessity, the latter of luxury. It is my insistence that no arbitrary distinction can be drawn between the two, nor can patients be readily classified in either of these categories.

Modern preventive medicine shows an increasing tendency to eradicate most infectious and contagious diseases, simultaneously with an increasing interest in the mental hygiene of the patient. In view

21. Blackwell, H. B.: Clinical Observation of External Deformities, Laryngoscope **33**:21, 1923.

of the latter development, can the medical profession conscientiously refuse aid to persons suffering from keen mental and spiritual distress as a result of facial disfigurement?

Such persons cannot be lightly dismissed as examples of superficial vanity. Whether male or female (and in my experience the male predominates, incidently), a patient afflicted with a disfigurement has as much moral right to assistance and consideration as one visited with organic disease.

If such is the case, can we as physicians take any other course than to raise the curtain of indifference and incognizance which has for so long concealed the subject of rhinoplasty and bring it into the full light of intelligent understanding? It is incumbent on us to adopt formally what has hitherto been a step-child into our medical family.

CONCLUSIONS

From the foregoing material, the following conclusions are conceivably justifiable:

1. Cosmetic surgery should not be confused with plastic nasal surgery.

2. Correction of nasal deformities is not so complicated as one is led to believe.

3. By aid of a photograph or a plaster of paris model, the work can be definitely planned in advance, an advantage not enjoyed by the surgeon in many other fields.

4. Cosmetic surgery is within the realm of the competent rhinologist. He is familiar with the anatomy, physiology and pathology of the nose. With a fair background of general medicine, he should get the best results.

5. In order to obtain good functional results, in a certain percentage of cases, correction of nasal deformity must be accomplished simultaneously, either before or after eradication of the pathologic process.

6. While it is true that a good many minor deformities are better let alone, there are still a large number of patients who suffer either socially or economically as a result of a nasal deformity. They should receive the same degree of consideration from the serious-minded physician as those afflicted with an organic disease.

7. The medical profession at large must acquaint itself with this problem so as to advise properly its patients. Physicians can then render their patients a service by keeping them out of the hands of unscrupulous persons and at times can prevent disastrous consequences.

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ABSTRACT OF DISCUSSION

DR. ADALBERT G. BETTMAN, Portland, Ore.: I wish to add the intranasal approach to the methods of rhinoplasty named by Dr. Wolf. I use this method almost exclusively, placing at once a silk suture on each edge of the incision and allowing the weight of attached hemostats to retract the edges. This practically brings the incision outside of the nose. I should also like to add the following facts. Patients with great deformity are grateful for any improvement; those with small defects may also be satisfied, provided they are not psychoneurotic and that they know what they want. Patients who have no definite type of nose in mind which they wish to have reproduced are often difficult to deal with, while those who know what the defect is and what kind of a nose they want are more easily pleased. Patients should be told what to expect, what can be done and what cannot be done. A person who is led to expect too much is sure to be disappointed. When multiple operations are required the patient should be so informed. They do not object to step procedures when the matter is explained to them in advance. Any procedure which makes for the mental or physical well-being of the patient is justifiable. It is important, before doing a reconstructive operation on any patient, that photographs be taken, and when possible, plaster or wax casts made. When this is done, no patient can deny his former condition nor question the improvement. The development of reconstructive surgery is following the usual course. First the gross deformities are corrected and later the minor lesions. The advisability of removing small defects is daily more appreciated by physicians and patients. A patient handicapped by a deformity, small when viewed by some one else but great to its possessor, is entitled to the relief that good surgical practice can give. These patients are very grateful. They are restored to their normal psychologic relations to society. Often their social position and economic welfare depend on their appearance. Corrective surgery—call it plastic, cosmetic, reconstructive, or what not—is ethical, and if qualified men do not take it up, unqualified men will. It is scientific, and it not infrequently lifts a great psychologic burden from the individual. Rhinoplasty is not difficult for the surgeon who can visualize the defect and the end-result.

DR. FREDERICK A. FIGI, Rochester, Minn.: The term "cosmetic nasal surgery" is distasteful to a number of members of the medical profession and also to many plastic surgeons. I think most of us interested in rhinoplasty much prefer the term "plastic" surgery or "reconstructive" surgery of the nose, because the type of work implied by these terms has greater justification and a wider field of usefulness than purely cosmetic nasal surgery. The patient who applies for reconstructive nasal surgery does so because he has a real deformity the correction of which is necessitated by both social and business relations. The patient who applies for what might be termed cosmetic surgery does so more for the gratification of pride. The man or woman who has lost all or a portion of the nose as a result of trauma of any kind is not only a social outcast, but is placed at serious disadvantage in business dealings. The same is true to a less extent of the patient with a saddle-back nasal deformity, which to the lay mind commonly indicates syphilis. In fact, any outstanding nasal deformity may produce real or imaginary handicap, and if it does its correction is justifiable. However, to what extent we are justified in correcting many of the minor nasal defects is questionable.

DR. J. D. LEWIS, Santa Barbara, Calif.: The essayist has not presented many points for discussion, nor can I see that he has suggested any new technical mehods or improvements of those now followed; therefore, there is little to say.

With reference to approaching the dorsum of the nose, he mentions the intranasal method. In the August, 1922, issue of the *Laryngoscope,* I described a method by which the nasal dorsum is approached externally through a vertical incision made in the columna of the nose, the opening being enlarged by undermining of the nasal tip. Through this small incision it is very easy to perform almost all operations for the correction of dorsal deformities, e. g., the removal of humps or the introduction of prosthetic material for the correction of saddle-nose. The method has several distinct advantages over the intranasal route; namely, the field of operation is amenable to sterilization, the operative technic is greatly simplified, and the resultant scar is invisible. Later the method was modified in this particular (*Laryngoscope,* August, 1924): When prosthetic material is to be introduced into the dorsal tunnel, it is generally advisable to divide the procedure into two stages: First, the tunnel is made and a period of four days allowed to elapse before introducing a prosthesis. This allows time for the lymph drainage and blood supply to readjust themselves and for an exudate to form and clothe the surfaces of the tunnel. This modification obviates postoperative reaction, renders the danger of infection negligible and facilitates the introduction of prosthetic material. While infections following intranasal methods employed in the correction of nasal deformities are not common, when they do occur, the results are often disastrous. All surgeons know that it is the occasional infection that always threatens—a thing we are constantly striving to prevent.

PERITRACHEAL ABSCESS*

LYMAN RICHARDS, M.D.
BOSTON

Acute infections of the mediastinum have long been recognized as grave surgical conditions offering little hope of recovery even in the face of drastic efforts at treatment. Further consideration of this group of cases, however, indicates that there is a finer classification depending on the location of the focus of entrance of the infection, the extent or lack of localization and the etiology of the infection itself. So-called acute mediastinitis, a fulminating, spreading and nonlimited infection is indeed an almost hopeless affair, but a mediastinal abscess, walled off and capable of some surgical approach for drainage, is by no means so discouraging. The former is usually traumatic in origin, such as may follow instrumentation of the esophagus, perforation of the esophagus or trachea by gun shot, or any other sudden entrance of infection into the mediastinal tissues. A mediastinal abscess, on the other hand, may result from an extension of an infection in an adjacent region, such as a periesophageal abscess, a retropharyngeal abscess or an abscess in the neck which has extended downward. Galen has recorded instances of such mediastinal abscesses, some of which must be classified as idiopathic in origin.

Hare, in 1888, recorded 115 cases of abscesses of the mediastinum, including three infants, in one of whom the infection was treated by opening an abscess in the neck. Lerche up to 1907, could find only 8 cases in which the suppuration originated in the neck and extended downward into the mediastinum. These were treated by drainage via the cervical route, in contradistinction to the other methods of approaching the mediastinum lower down through the back or by removal of portions of the sternum. In Abt's "System of Pediatrics" is mentioned the burrowing of pus in the groove between the trachea and esophagus.

Thus it appears that there exists a surgical condition in which infections of the neck may extend downward into the superior mediastinum without producing so serious and acute a condition as to defy any except the most drastic surgical measures. The symptoms of such a condition are, aside from the usual manifestations of sepsis, some degree of pressure on the upper respiratory tract and on the esophagus itself, with resultant dyspnea and dysphagia. Hence, surgical drainage is indicated, both in order to terminate the infection and to relieve respiratory obstruction and the inability to partake of food.

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* Submitted for publication, Nov. 18, 1929.

* Read at the Twelfth Annual Meeting of the American Bronchoscopic Society, San Francisco, July 6, 1929.

From an anatomic point of view, such abscesses are more common in the anterior than in the posterior mediastinum. They may point externally in various places, such as the supraclavicular fossa, ulcerate into the trachea or esophagus or extend downward toward the diaphragm. The prognosis is better when they point externally, though at times even when undrained they have remained localized and become chronic.

Such a localized mediastinal infection must be differentiated from an encapsulated empyema, an abscess of the lung or an infection of the thymus gland. In 100 necropsies performed at an army camp, 11 substernal pockets of pus were discovered. Such pockets, however, were not all in the mediastinum; in a few instances they were found to be in the pleural cavity as a localized empyema.

Because of the occurrence of just this problem in diagnosis in an infant aged 1 year, I shall present the features of the following case.

REPORT OF CASE

The patient was admitted to the Children's Hospital in Boston, Jan. 14, 1929, the complaint being dyspnea of four days' duration. The onset of the illness was six weeks previously, and was marked by a nasal discharge, cough, rapid respirations and a temperature of 104 F. This continued for two weeks and the condition was thought to be a bronchopneumonia. There was some improvement, but the fever continued, and there was a loss in weight. Four days before entrance, all symptoms became aggravated, particularly by labored breathing, refusal of all food and general prostration.

On admission the child appeared acutely ill, prostrated and dehydrated, with rapid, deep and labored breathing. There was an expiratory crow, and soft, inspiratory stridor suggestive of laryngeal obstruction. At this time there was no suggestion of any glandular swelling about the neck. A report of the results of direct examination of the larynx was as follows:

"There is a considerable edematous swelling of both arytenoids. The vocal cords do not look abnormal. There is no membrane and the glottic space below the cords looks adequate. The appearance is that of any early streptococcus inflammation involving the glottic rim. This may quiet down under conservative treatment by inhalations and expectorants. I should advise intubation if dyspnea increases."

This opinion was in accordance with the views expressed at the last meeting of the American Bronchoscopic Society that in such cases of streptococcus laryngitis, intubation might be preferable to tracheotomy. The roentgen report on admission was that of a localized collection of fluid in the apex of the right lung, but the patient was dyspneic and stridorous out of all proportion to the observations in the chest.

The question of treatment was the immediate concern. For some time previously it had been the intention to place the next patient with acute laryngeal infection in the so-called "oxygen tent." This apparatus was designed to provide better oxygenation for patients acutely ill with pneumonia and as such has proved its life-saving value over and over again. It was felt that if acute laryngitis, like acute tonsillitis, was a somewhat self-limited infection, the patient could be tided over this period of dyspnea and aided in breathing by an increased supply of oxygen,

until such time as the laryngeal edema subsided. In this way it was hoped to avoid either tracheotomy or intubation. For the succeeding twenty-four hours the infant was much more comfortable in the tent, and there was a marked difference in respiration inside and outside the apparatus. The next day, however, the patient was restless and did not take food well. Two days later, with the infant still in the tent, dyspnea and stridor were increased, with marked retraction of the chest wall.

Tracheotomy was urged by the pediatric staff and seemed an absolute necessity in such a situation. The operation is recorded as follows:

"Incision over the trachea. On dividing the pretracheal muscles there was a sudden gush of thick yellow pus from the left side of the trachea. There had been no evidence of swelling over the trachea which was palpable under the skin. There was a cavity of uncertain size extending posteriorly, apparently behind the trachea.

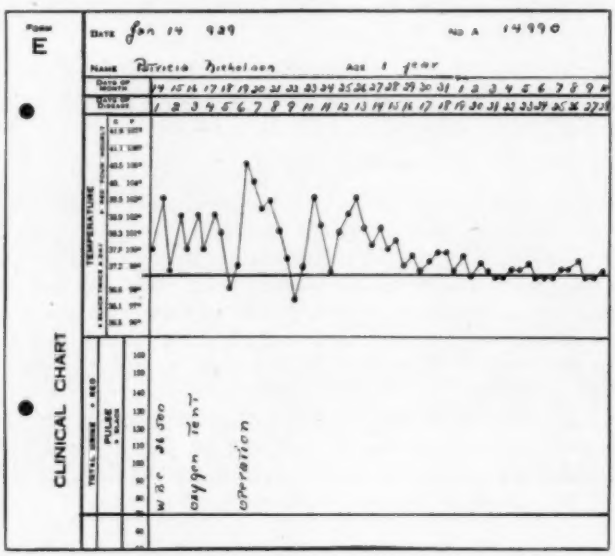


Fig. 1.—Temperature chart indicating the general course of the disease before and after operation.

This was packed with iodoform gauze. The trachea was not opened, as it was felt that the dyspnea had been due to the pressure of this abscess and that there was no essential laryngeal obstruction. A culture of the pus showed a hemolytic streptococcus."

The subsequent convalescence is indicated by the temperature chart shown in figure 1. There were several stormy days immediately after the operation during which there was irregular fever, but less dyspnea, with apparently a good deal of benefit from the oxygen tent in which the infant was kept for several days more. The greatest difficulty was in feeding the patient who still suffered markedly from dysphagia, a symptom now attributed to the general swelling in the tissues of the neck with pressure on the esophagus. Gavaging was necessary for more than a week later, a situation which led to a surgical consultation as to whether this dysphagia might be due to a deeper mediastinal infection, still undrained. Clyses and two transfusions were resorted to in the meantime.

COMMENT

Figure 2 represents two x-ray films. The first is that of the chest condition shortly after entrance. Here will be noted the sharply delineated shadow diagnosed as fluid in the right upper part of the chest. Next to this is a picture of the chest six days after the incision of the abscess in the neck. While there is no proof of the direct relationship of cause and effect, it is natural to conclude that drainage of the abscess had some connection with the rapid disappearance of the x-ray shadow in the apex of the right lung. If there was a direct connection, then the collection of fluid seen by roentgen examination may well be regarded as lying in the superior mediastinum into which it had extended from the neck, with the resulting bulging of the right mediastinal wall to the right. On the other hand, the mediastinal infection

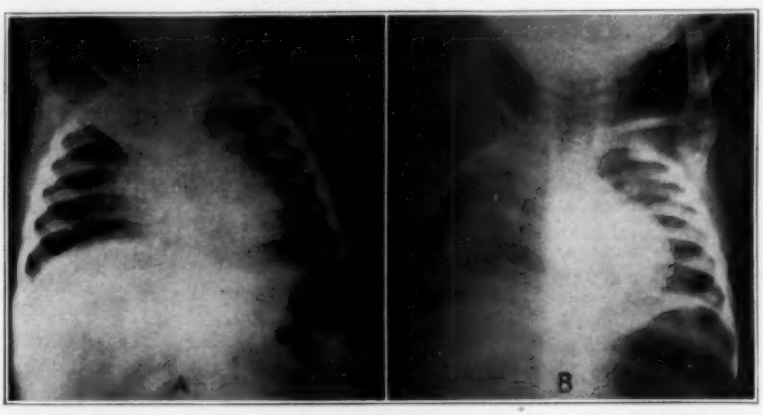


Fig. 2.—The chest before and after operation. *A* shows the sharply demarcated collection of fluid in the apex of the right lung. *B*, the rapid resolution in this region after incision of the peritracheal abscess.

may have originated in this region, with some periesophageal infection as the starting point and then burrowed its way upward and to the left, to point finally at the spot on the left side of the trachea where it was drained. The location of the drainage point on the left and the x-ray shadow on the right would be more puzzling were it not that a similar crossing of pus behind the trachea was noted by Lerche in an experiment mentioned later.

If, however, the x-ray shadow denoted a localized empyema following the evident pneumonia, there are two conditions to explain—the empyema and the peritracheal abscess. Moreover, there is no particular reason why an encapsulated empyema should disappear after drainage of the cervical abscess. During the days of convalesence when dysphagia was so marked, the surgical staff was greatly tempted to explore this

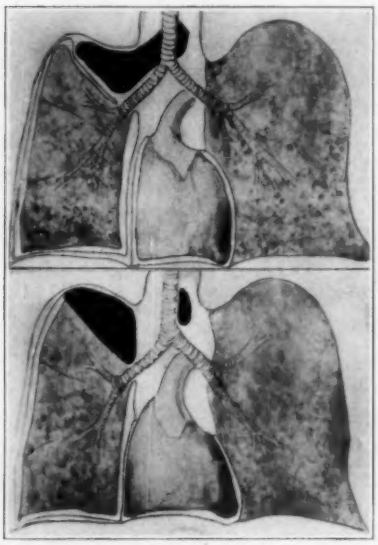


Fig. 3.—Two schematic drawings showing the possible locations of the abscess. Above, a mediastinal abscess continuous with the peritracheal abscess; below, an encapsulated apical empyema entirely distinct from the peritracheal abscess.

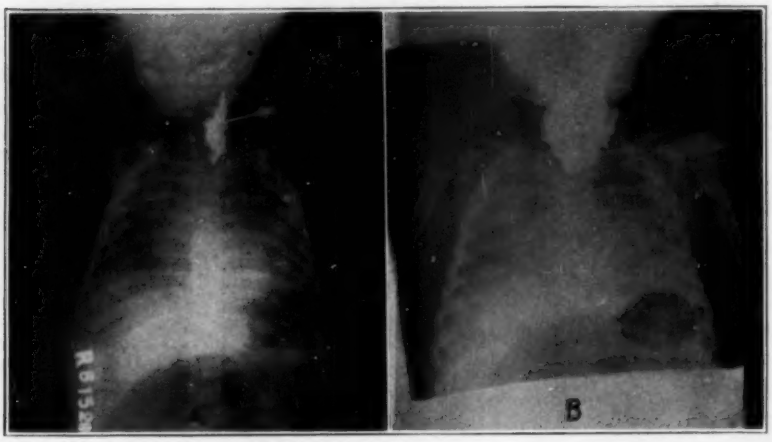


Fig. 4.—Injections of iodized oil in a cadaver. *A*, initial injection of the oil in the region of the peritracheal abscess; *B*, further injection of more oil made to ascertain if there was any tendency for the oil to pass behind the trachea into the region of the apex of the right lung.

collection of fluid with a needle and even considered an external operation, but fortunately refrained until this collection of fluid vanished following the drainage of the abscess.

One more possibility remains to be considered, namely, that of an encapsulated empyema which, like the empyema necessitatis, burrowed its way into the neck.

In figure 3 are shown highly schematic drawings of the two possibilities: (1) an encapsulated empyema and a cervical abscess, and (2) a mediastinal infection with cervical extension; either of these would give essentially the same appearances in a roentgenogram. An empyema burrowing into the neck would likewise show a film of similar appearance.

In an effort to throw further light on the problem of this differential diagnosis, I procured a recent infant cadaver and injected iodized poppy-seed oil 40 per cent into the exact region in the neck where the pus was evacuated at the time of operation. The results are shown in figure 4. I then made a further injection from this same point with added force in the hope of discovering that there was a tendency for the oil to extend downward and perhaps to the right in the mediastinal tissues. In this I was disappointed, as the increased pressure only resulted in a diffusion of the opaque material around the initial point of injection.

I had thought that this simple experiment might have an element of originality about it, but I was not surprised to find in my first bibliographic reference that Lerche had already injected barium sulphate in buttermilk into the upper part of the groove between the trachea and the esophagus. He said that with gradually increasing force the mass was found to extend laterally along the esophagus and trachea into the superior mediastinum; when greater force was used, it crossed in front of the trachea to the opposite side. This crossing is important in view of the observation in the present case, although here there was no sign of an infection anterior to the trachea.

The patient finally made a complete convalesence. The abscess cavity, which was never probed, filled in and healed without further symptoms.

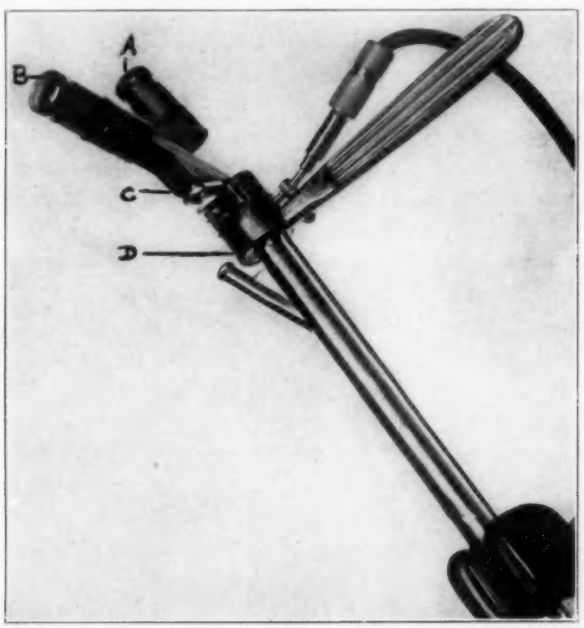
I have entitled this report "Peritracheal Abscess" as the case still admits of some doubt as to whether it was a true mediastinal abscess.

Clinical Notes

DEMONSTRATING BRONCHO-ESOPHAGOSCOPE*

CHARLES J. IMPERATORI, M.D., NEW YORK

This device consists in a two vision telescopic attachment for the Jackson type of bronchoscope and esophagoscope. The direct telescopic view is obtained by the operator by attaching the device to the proximal end of the bronchoscope or esophagoscope after the usual introduction of the endoscope. An individual focusing arrangement for the operator and the observer is provided.



A is the operator's eyepiece; *B*, the observer's eyepiece; *C*, the prism, and *D*, the bronchoscope.

There is no magnification, distortion or inversion of the image. The operator has a direct view of the field, while the observer's view is through a prism. A collar on the attaching mechanism permits the observing telescope to be turned to either the right or the left of the operator. In teaching and demonstrating, the value of this attachment is obvious.

Mr. Reinhold Wappler, of the American Cystoscope Makers, Inc., made this instrument for me.

17 East Thirty-Eighth Street.

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*Read at the Twelfth Annual Meeting of the American Bronchoscopic Society, San Francisco, July 6, 1929.

Progress in Otolaryngology

A Summary of the Bibliographic Material Available in the Field of Otolaryngology

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PERORAL ENDOSCOPY *

LOUIS H. CLERF, M.D.
PHILADELPHIA

General interest in bronchoscopy and esophagoscopy, more widespread application of these measures as a means of diagnosis and of treatment and an increasing desire on the part of laryngologists to perfect themselves in the technical knowledge so necessary to employ these methods safely have done much to contribute to the sum total of the knowledge concerning diseases of certain organs and structures. Among the outstanding contributions for the current year in the field of peroral endoscopy are certain observations on peptic ulcer of the esophagus. These were made possible only by the data secured by direct inspection of the interior of the esophagus by esophagoscopy.

Chevalier Jackson [1] expressed his belief that when the time shall have come that every patient with the slightest discomfort or abnormality in swallowing, every patient with pain or discomfort back of the sternum, every patient with gastric hematemesis, every patient with regurgitation, "heartburn" or "waterbrash" is examined esophagoscopically, peptic ulcer of the esophagus will be found less rare than it is now thought to be, though it is probably not a common disease.

Jackson reported eighty-eight cases of peptic ulcer; of these twenty-one were active ulcers and sixty-seven were scars probably due to preceding peptic ulcers. The etiology, symptomatology and diagnosis were discussed. The chief characteristics of the esophagoscopic appearance were the flatness of the lesion, the absence of annular infiltration of the esophageal wall and the absence of exuberant fungations. In the early stages, these characters were well marked; later, the edges became somewhat raised, and still later, slightly undercut. In no instance were there found the fungations commonly seen in cancerous ulcerations. There was usually a zone of contrasting intense hyperemia around the edge of the ulcer. The lesions commonly were single. In most cases, the ulcer was elongated; in five, it was round.

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* Submitted for publication, Jan. 30, 1930.

1. Jackson, Chevalier: Peptic Ulcer of the Esophagus, J. A. M. A. **92**: 369 (Feb. 2) 1929.

Jackson concluded that deductions from eighty-eight cases of peptic ulcer of the esophagus suggest focal infection as the chief etiologic factor, with the tonsil as the most frequent site of the focus. Islands of gastric mucosa are accessory causes. Retrograde flow of gastric juice may or may not be a perpetuating etiologic factor, but it is certainly a cause of the pain. The most characteristic symptom of peptic ulcer of the esophagus is retrosternal pain or discomfort extending through to the back. Chronic esophagitis is accompanied by the same symptoms, but they are less severe. Ulcer may be symptomless.

Esophagoscopy for diagnosis is indicated in every patient complaining of the slightest abnormality in swallowing or the slightest degree of retrosternal pain or discomfort.

The best treatment for peptic ulcer is by eradication of focal infection, plus the local esophagoscopic application of argentic nitrate, or bismuth subnitrate. Palliative control of the symptom, pain or discomfort is afforded by alkalis, especially sodium bicarbonate. Opiates are unnecessary and are contraindicated.

In discussing the etiology of peptic ulcer of the esophagus, Friedenwald [2] and his associates expressed their belief that it is necessary that the cardia remain patent, so that regurgitated acid gastric juice may continue its corrosive effect on the localized diseased area in the esophageal mucous membrane. Dysphagia and substernal discomfort were present in every case observed. Pain was a constant symptom occurring in eleven of the thirteen cases. They observed that pain is always increased during the act of deglutition, a sign that distinguishes it from gastric ulcer. The writers concluded that although peptic ulcers of the esophagus are rare, they occur sufficiently often to be of clinical interest. They are usually observed in the lower third of the esophagus though occasionally they are located higher. These ulcers vary greatly in size and are usually single; the right posterolateral wall is most frequently involved. They resemble in many respects ulcers of the stomach and duodenum. Perforations are not uncommon. In large ulcerations, contraction takes place with the formation of stenosis and dilatation. In the small superficial ulcerations, healing is usual and the esophageal lesion is apt to be overlooked. Ulcerations of the esophagus have been most frequently observed in adults, more commonly between the thirtieth and seventieth years, and are found equally divided between males and females.

The most prominent symptoms of the disease are pain, dysphagia, vomiting, hemorrhage and perforation. There is often great difficulty in arriving at a diagnosis; however, this may be greatly aided by means

2. Friedenwald, J.; Feldman, M., and Zinn, W. F.: Peptic Ulcer of the Esophagus, Am. J. M. Sc. **177**:1 (Jan.) 1929.

of fluoroscopy and esophagoscopy. The treatment consists in the eradication of foci of infection, rest, the regulation of the diet and the administration of olive oil, alkalis and belladonna and at times by the direct application to the diseased area of various remedies such as a solution of nitrate of silver through the esophagoscope. If healing does not occur following this plan of treatment, gastrostomy should be performed to insure adequate feeding and the esophagus kept at rest for a considerable period of time.

VARIOUS CONDITIONS OF THE ESOPHAGUS

Lupus of the Esophagus.—This condition is rare, and Forbes'[3] case undoubtedly is an outstanding one. The patient, a woman, aged 32, had previously received treatment for lupus lesions on the nose, nasal septum and soft palate. She was sent to Forbes because of dysphagia for solid food. At esophagoscopy, there was found a contraction of the esophageal lumen, beginning at a point 20 cm. from the upper teeth and extending downward for a distance of 3 or 4 cm., apparently due to an ulceration along the posterior and left lateral wall. The lesion was practically healed but presented the typical textbook appearance, consisting of minute pinkish-yellow nodules, the so-called "apple jelly" nodules. Some were broken down, but these were few as compared with those in the healed areas. By esophagoscopy, the strictured area was dilated so that an 11 mm. esophagoscope could be passed beyond the lesion. At this point the mucous membrane appeared normal. The patient's condition was greatly improved, and there was no further difficulty with swallowing.

Varix of the Esophagus.—Although esophageal varices are the most common cause of hematemesis in splenic anemia, Moyer[4] agreed that they must always be considered as a potential source of hemorrhage into the gastro-intestinal tract. Esophagoscopy is necessary to demonstrate their presence and to determine the size of the veins, the extent of the area involved and the existence of ulceration and hemorrhage. At the time of esophagoscopy there may be no positive proof that the bleeding occurred from the varices but it should be recalled that in a copious hemorrhage the bleeding point may appear small and inconspicuous. Two cases of varices of the esophagus are reported. Hemorrhages persisted after splenectomy, and at esophagoscopy there were found, in each case, marked venous varicosities in the lower thoracic

3. Forbes, H. H. L.: Lupus of the Esophagus, Arch. Otolaryng. **9**:441 (April) 1929.

4. Moyer, J. S.: Esophagoscopic Study of Esophageal Varices: Report of Two Cases of Esophageal Varices Persisting After Splenectomy, Arch. Otolaryng. **10**:409 (Oct.) 1929.

and the abdominal esophagus. The esophagoscopic observations are important to the surgeon in determining the form of treatment to be employed. If no varices are found at esophagoscopy, the more probable source of the hemorrhage is the veins about the stomach and duodenum.

Pulsion Diverticulum of the Esophagus.—In reporting a number of cases of pulsion diverticulum of the esophagus, Sturgeon [5] reviewed the various theories held concerning etiology and discussed the question of diagnosis. Although the recognition of a diverticulum is not difficult if the esophagus is studied roentgenologically with an opaque mixture, he agreed with the views of esophagoscopists generally, that the diagnosis is never complete without an esophagoscopic examination. This will demonstrate or rule out other pathologic conditions of the esophagus, such as stricture or cancer.

Since reporting on his method of inverting the pulsion diverticulum through the esophagoscope, Imperatori [6] studied four additional cases and performed the operation in one instance with unfavorable results. He pointed out the dangers and quoted Jackson's dictum that the esophagus is one of the organs that is most intolerant of trauma, a fact that should always be borne in mind in operations on the esophagus. If this is done, there will be fewer fatalities.

Pouch of the Esophagus.—In Mosher's [7] case, difficulty in swallowing solid food began suddenly and later there was observed a soft swelling on the right side of the neck. By fluoroscopy, the esophagus was found much dilated and filled with air. There was observed on the right a pear-shaped pouch, also filled with air, and extending in the chest as far as the arch of the aorta. At esophagoscopy, the esophagus was readily entered, and at a point 18 cm. from the incisor teeth the opening was found to the left and of good size. To the right the mucous membrane was thrown into folds. Ballooning reduced the folds and disclosed a pouch on the right, the opening of which was easily passed. The lower end of the esophagus was dilated with a Sippy dilator. On returning three months later, the patient stated that she was eating everything. The swelling in the side of the neck had not recurred.

Perforation of the Esophagus.—In five of King's [8] cases the perforation of the esophagus occurred following the swallowing of a

5. Sturgeon, C. T.: Esophageal Diverticula, J. A. M. A. **92**:379 (Feb. 2) 1929.

6. Imperatori, C. J.: Endoscopic Treatment of Pulsion Diverticulum: A Further Report, Arch. Otolaryng. **9**:266 (March) 1929.

7. Mosher, H. P.: Pouch of the Esophagus, Arch. Otolaryng. **9**:547 (May) 1929.

8. King, E.: Perforation of the Esophagus with Report of Six Cases, Ann. Otol. Rhin. & Laryng. **38**:351 (June) 1929.

foreign body, while in the sixth case it followed blind bouginage. In two, the perforation occurred in the thoracic esophagus, and in four the cervical portion was involved. There was one death. Pain is commonly the first symptom, followed by dysphagia, fever and rapid pulse. Swelling of the tissues and emphysema are often accompanying signs. The roentgen ray is an important aid in the recognition of early emphysema and in determining the progress of the lesion. King expressed his belief that external drainage should be resorted to in certain of these cases.

Esophagoscopists are in agreement that suppurative inflammation of the tissues surrounding the esophagus is a most dreaded complication. Kramer [9] reported three cases of periesophageal suppuration in which esophagoscopic treatment was successful. The first case represented a mild form of suppuration located within the layers of the esophageal wall. In the second case there was necrosis of the superficial layers of the esophageal wall with extensive suppuration in the deeper layers, probably involving the deep cervical or periesophageal regions, with fairly severe local and systemic symptoms. The third case represented the severest form of infection, namely, mediastinal infection following a laceration of the esophageal wall. The treatment should consist of a diagnostic esophagoscopy to determine the nature of the lesion, to remove any foreign body present and to evacuate the abscess cavity. General supportive measures are necessary; if improvement does not promptly follow, external drainage should be considered.

Cancer of Esophagus.—Guns [10] strongly urged the use of the esophagoscope in esophageal disease. He stated that in every case of esophageal dysphagia a roentgen study should be made, followed by esophagoscopy on the basis of these observations. His contention, shared by all esophagoscopists, was that by this routine procedure something can be done toward lowering the mortality rate of cancer of the esophagus.

Congenital Atresia of Esophagus.—In Simpson's [11] three cases of congenital atresia, the lower end of the esophagus opened into the trachea just above the bifurcation. These cases conform to the type most commonly observed. Gastrostomy was performed as soon as the diagnosis of congenital atresia was made; however, all the patients died of bronchopneumonia.

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9. Kramer, R.: Endoscopic Treatment of Esophageal Suppuration, Laryngoscope **39**:97 (Feb.) 1929.

10. Guns, P.: Cancer of Esophagus, Arch. d. mal. de l'app. digestif **19**:420 (April) 1929.

11. Simpson, W. L.: Congenital Atresia of the Esophagus with Tracheo-Esophageal Fistula, Arch. Otolaryng. **9**:267 (March) 1929.

The Aorta and Esophagoscopy.—Moyer [12] reviewed his observations in three patients with compression stenosis of the esophagus due to aortic disease. In each, the condition was atypical. In one case, the stenosis was due to multiple aortic aneurysms; in a second, it resulted from aortic encroachment unassociated with aneurysm, while in a third, the aortic compression played a contributory although not the chief part in producing the esophageal symptoms. Moyer concluded that the Jackson progressive high-low position tends to protect the aorta in esophagoscopy. Aneurysm of the aorta is not an absolute contraindication to esophagoscopy for diagnosis. Without special roentgen technic, a condition in the lower part of the thorax that is of interest to the endoscopist may be overlooked in the ordinary anteroposterior film made primarily to determine the condition of the lungs. In studying the esophagus, in addition to the usual oblique and lateral films, it is desirable to have an anteroposterior roentgenogram of the chest in which, so far as is possible, the detail of structures within the cardiac shadow is brought out. An elongated, tortuous, sclerotic aortic arch, in the absence of aneurysmal dilatation, may produce esophageal compression with symptoms. When a foreign body lodges in the esophagus at the site of a stenosis due to aortic pressure, it should be cautiously dealt with by endoscopic means.

BRONCHOSCOPY IN DIAGNOSIS

In a review of bronchoscopy in its application to the broader field of general medicine, Yankauer [13] emphasized its value in the diagnosis of diseases of the chest, and set forth certain reasons why this subject should be of particular interest to the general diagnostician. In some cases it affords the only means of making a final and conclusive diagnosis; for instance, it affords the opportunity for a biopsy. Negative bronchoscopic observations, like other negative observations, make possible a diagnosis by exclusion, which is often valuable. Bronchoscopy sometimes succeeds when other means fail, as by making possible a bacteriologic study of the uncontaminated flora of the deeper parts of the lungs, even to the extent of finding tubercle bacilli when repeated examinations of the expectorated sputum have failed to disclose them. Rare and unsuspected conditions, not otherwise recognizable, may be found. In appropriate cases, it becomes possible to institute therapeutic measures at the same time with, and because of, the recognition of the true condition.

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12. Moyer, J. S.: The Relation of the Aorta to Esophagoscopy, Arch. Otolaryng. **10**:447 (Nov.) 1929.

13. Yankauer, S.: Bronchoscopic Diagnosis and Treatment of Lung Abscess, Laryngoscope **39**:215 (April) 1929.

In a general discussion of the advantages of peroral endoscopic measures in diagnosis, Beatty [14] enumerated a list of the generally accepted indications for these measures. He emphasized what endoscopists have long believed absolutely necessary, namely, the importance of adequate training before attempting any of these operations; these measures are not dangerous if properly performed.

Obtaining secretion from the tracheobronchial tree of infants and children for bacteriologic study is always a problem, since they do not expectorate and invariably swallow secretion coughed into the throat. Goldman [15] found that direct laryngoscopy afforded a satisfactory and simple method of obtaining secretion from the larynx, trachea or bronchi. This method can be quickly carried out, without anesthesia and with a minimum of apparatus.

In a review of a number of endoscopic cases, King [16] discussed the benefits of closer cooperation between the bronchoscopist and other departments. He concurred with other observers in the need of careful roentgen studies in all cases of foreign bodies, not only with regard to localization, but also, whenever possible, with regard to the size and shape of the object. His experiences with bronchoscopy in pulmonary abscesses coincided with those of others, and he pleaded for a more general application of this form of treatment.

In directing the attention of the medical profession to the advantages of introducing oxygen directly into the trachea, Guerinot [17] reported his experiences in the treatment of a case of carbon monoxide gas poisoning occurring in an infant, aged 4 days. The child was unconscious. Guerinot introduced a 4 mm. bronchoscope into the trachea and piped oxygen directly into the lungs for twenty-five minutes. The child made an uneventful recovery without complications.

NEOPLASMS OF THE BRONCHUS

Fibrolipoma of the Bronchus.—To a group of ten cases of bronchial neoplasms which were removed bronchoscopically, Myerson [18] added an additional case in which a large fibrolipoma was removed from the left

14. Beatty, H. G.: The Diagnostic Value of Broncho-Esophagoscopic Examinations, Ohio State M. J. **25**:634 (Aug.) 1929.

15. Goldman, I. B.: Direct Laryngoscopy as a Method for Cultural Studies of Pulmonary Secretions in Infants and in Children, Am. J. Dis. Child. **38**:47 (July) 1929.

16. King, E.: Bronchoscopy: Its Relation to the Other Departments of the Hospital, Laryngoscope **39**:91 (Feb.) 1929.

17. Guerinot, A. J.: Bronchoscopy and Esophagoscopy in Infancy, Laryngoscope **39**:309 (May) 1929.

18. Myerson, M. C.: Benign Neoplasms of the Bronchus: Report of a Case of Bronchoscopic Removal of a Fibrolipoma from the Left Main Bronchus, Arch. Otolaryng. **9**:376 (April) 1929.

main bronchus. The patient, a man, aged 47, had been ill for eighteen months; during this time, he had been under the care of a number of physicians in a number of hospitals. No definite diagnosis was made, although it was believed that he had asthma. When he was seen by Myerson, there were physical signs of atelectasis of the left lung. At bronchoscopy, a large mass was encountered which filled the left main bronchus. Because of the movement of the tumor with respiration it was thought to be pedunculated. When removal was attempted at a subsequent bronchoscopy, it was found that the tumor was bilobular and that the posterior lobe was cystic. The cyst was ruptured with forceps and thin fluid escaped. Air could then enter the left bronchus and the left lung expanded. The tumor was completely removed and the patient remained practically free from all symptoms. There persisted a moderate bronchiectasis of the left lower lobe. This case further emphasizes the necessity of bronchoscopy in obscure conditions of the chest in order to establish a correct diagnosis, and also shows that benign neoplasms of the bronchus can usually be readily removed by bronchoscopic means.

Carcinoma of the Bronchus.—Burrell [19] reported the case of a man, aged 29, who complained of pain in the chest, cough, dyspnea and blood-stained sputum. There was a history of an accident and the breaking of a tooth; it was thought that he might have aspirated the tooth. A diagnosis of pulmonary collapse was made from the physical signs and roentgen observations. No shadow of a foreign body being visible, a bronchial tumor was suspected. A diagnostic bronchoscopy was done, and a red, rounded mass was seen in the right main bronchus. At a subsequent bronchoscopy, the growth was found to have a definite pedicle. It was completely removed by biting forceps; the point of attachment appeared as a small excoriated area. Although the tumor looked like a soft fibroma, the histologic diagnosis was adenocarcinoma.

Hajek [20] reported a case of a man, aged 74, who complained of dyspnea which could not be accounted for by indirect examination of the pharynx, larynx and upper part of the trachea. A tracheoscopy was performed. There was found a large tumor springing from the right tracheal wall and partially occluding the orifices of both main bronchi. The entire tumor was removed piecemeal, and proved to be a pure fibroma. After two years, the patient remained well. Another equally interesting case was that of a man, aged 50, who was very dyspneic and hoarse. There was found a flat, uneven tumor involving

19. Burrell, L. S. T.: Case of Adenocarcinoma of Bronchus, Lancet **2**:708 (Oct. 5) 1929.

20. Hajek, M.: Laryngo-Rhinology and General Medicine, Laryngoscope **39**: 75 (Feb.) 1929.

the subglottic area of the right side of the larynx. Additional examinations indicated that extensive changes were present in the entire left lung, suggesting either extensive infiltration or atelectasis. Since the laryngeal lesion did not seem to be of sufficient size to account for the dyspnea, it was decided to do a bronchoscopy. A large tumor was found occluding the left main bronchus; it was unquestionably cancer. Necropsy confirmed the clinical diagnosis; the bronchial tumor was the primary growth, and the subglottic area was of metastatic origin.

The necessity of a diagnostic bronchoscopy to determine the cause of bronchial obstruction was again demonstrated by Kernan and Cracovaner,[21] who reported a case of carcinoma of the left main bronchus which produced an intermittent atelectasis of the lung. The diagnosis was made by bronchoscopy and biopsy. The growth was partially removed at bronchoscopy, radium needles were inserted and surgical diathermy was administered through the bronchoscope. When last examined bronchoscopically, the entire tumor mass was gone. It was replaced by a whitish area suggesting scar tissue. The patient was symptomatically well.

Asthma.—In a report on seven patients with asthma who were treated bronchoscopically, Daily and Daily [22] corroborated many of the observations made by others concerning the appearances of the tracheobronchial mucosa, the collapse of the trachea during cough and expiration and the character of the secretion. They agreed that bronchoscopy is positively indicated in cases of asthma when all other means of investigation have failed to establish a correct diagnosis and when relief from symptoms cannot be obtained by the usual measures.

PULMONARY ABSCESS

The report by Flick [23] and his associates is important, as it includes an analysis of a large group of cases. It is of particular value because it represents the ultimate results of combined effort, namely, the close cooperation of the internist, roentgenologist, bronchoscopist and surgeon. Data bearing on the sites of the abscesses and the ages of the patients are noteworthy. Considerable importance is attached to the rôle that bronchoscopy plays not only in diagnosis but also in treatment; in fact, practically 80 per cent of the patients accepted for treatment were first referred to the bronchoscopist.

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21. Kernan, J. D., and Cracovaner, A. J.: Carcinoma of the Lung, Arch. Surg. **19**:315 (Jan.) 1929.

22. Daily, L., and Daily, R. K.: The Value of Bronchoscopy in the Diagnosis and Treatment of Asthma, Laryngoscope **39**:304 (May) 1929.

23. Flick, J. B.; Clerf, L. H.; Funk, E. H., and Farrell, J. T., Jr.: Pulmonary Abscess: An Analysis of One Hundred and Seventy-Two Cases, Arch. Surg. **19**:1292 (Dec.) 1929.

The writers concluded that the diagnosis and treatment of abscess of the lung require the close cooperation of internist, roentgenologist, bronchoscopist and surgeon. The prognosis in a given case is often favorably influenced by the teamwork of this group. A diagnostic bronchoscopy should be done in all cases of pulmonary abscess irrespective of the method of treatment to be employed. The sine qua non in treatment is the establishment of adequate drainage. This may be accomplished in many cases by conservative measures which include bronchoscopic aspiration. The indications for surgical treatment have been outlined. Conservative treatment should not be continued too long if distinct benefit is not obtained, since complications occur which increase the risk and decrease the chances of recovery with surgical intervention.

Johnson [24] reported remarkable results in a series of four cases of pulmonary abscess following bronchoscopic treatment. In three instances, the patients were so critically ill when the first bronchoscopy was performed that the question arose as to the advisability of carrying out the procedure. In every case there was striking improvement following a single bronchoscopic aspiration.

In discussing the treatment for pulmonary abscess, Gutteridge [25] agreed that bronchoscopy should be instituted early, in fact, as soon as the diagnosis is completed. He emphasized the importance of general medical measures and concurred that the best results are obtained by the close cooperation of physician, surgeon, bronchoscopist and roentgenologist under the general supervision of the physician.

Martin [26] discussed the value of bronchoscopy and its application to general medical diagnosis and treatment. The question of foreign bodies was briefly discussed and several case reports of bronchial foreign body were presented to emphasize the importance of diagnostic bronchoscopy when obscure signs and symptoms are present in the chest, even if no history of a foreign body can be elicited. Martin has had satisfactory results in the treatment for bronchiectasis by bronchoscopic lavage of the bronchiectatic area with a weak boric solution. In the treatment for asthma by vaccine therapy he corroborated the observation that these patients are benefited by an autogenous vaccine made from bronchoscopically removed secretion, whereas there was no response to vaccine made from sputum.

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24. Johnson, L. F.: Bronchoscopy in Acute Lung Abscess, New England J. Med. **200**:64 (Jan. 10) 1929.

25. Gutteridge, E.: Suppurative Diseases of the Lungs from the Bronchoscopic Standpoint, M. J. Australia **2**:260 (Aug. 24) 1929.

26. Martin, G. E.: The Bronchoscopic Diagnosis and Treatment of Bronchiectasis and Other Chronic Non-Tuberculous Diseases of the Chest, Edinburgh M. J. **36**:153 (Aug.) 1929.

EXPERIMENTAL INVESTIGATIONS CONCERNING THE ETIOLOGY OF PULMONARY ABSCESS

With the production of an extensive literature on the experimental and clinical studies carried out to determine the etiology of pulmonary abscess, the question of the advisability of reviewing this has arisen. Too often, an abstract is inadequate to set forth sufficient of the important details. It is therefore believed that brief reference to these studies should be made by simply setting forth the problems and the ultimate conclusions.

Lambert and Weeks [27] made no attempt to ascertain whether abscess of the lung is of embolic or aspiratory origin; their studies were carried out purely from a bacterial standpoint. They employed the embolic method of abscess production, believing that the chances for infection were less by this method than by the peroral method. They found that anaerobes associated with pulmonary abscess in man are pathogenic for dogs. Single discrete pulmonary abscesses may be caused in dogs by employing anaerobes alone in a blood clot. They expressed the belief that anaerobes are not simply secondary invaders but can and do cause suppuration of the lungs.

The occurrence of a suppurative pneumonitis and extrabronchial abscess as a complication of tonsillectomy, with the later development of a bronchiectatic abscess, as reported by Aschner, suggested itself as a problem for investigation to Harkavy.[28] The studies were carried out by introducing bronchoscopically in dogs mixed cultures of bacteria recovered from patients suffering with abscess of the lung complicating tonsillectomy. Harkavy expressed the belief that the greater amount of evidence is in favor of aspiration as the mode of production of suppuration of the lung following operations on the upper respiratory tract. He was unable to reproduce bronchiectatic abscesses in dogs, although suppurative pneumonitis and extrabronchial abscess occurred. If the sequence of events occurring in the dog may be applied to that occurring in man, he suggested that following aspiration of infectious material from the upper respiratory tract the probable outcome is as follows: pneumonitis, necrosis and cavity formation, and then healing or persistence of the primary abscess with the formation of secondary bronchiectasis.

Scarff [29] was unable to produce a pulmonary abscess in over fifty experiments carried out by bronchoscopic and by transpleural methods.

27. Lambert, A. V. S., and Weeks, C.: Experimental Production of Abscess of the Lung, Arch. Surg. **18**:516 (Jan.) 1929.

28. Harkavy, J.: The Pathogenesis of Aspiratory Abscess of the Lung: Its Possible Relation to Abscess of the Lung Following Tonsillectomy, Arch. Int. Med. **43**:767 (June) 1929.

29. Scarff, J. E.: Experimental Production of Pulmonary Abscess: Etiologic Factors, Arch. Surg. **18**:1960 (June) 1929.

He then infected the frontal sinuses in a series of eight dogs, and later introduced a small pledget of cotton, inoculated with pus from the sinus, into a secondary bronchus. The production of pulmonary abscesses in five of the eight dogs indicated that the chronic sinus infection in some way contributes to the formation of the abscess. He stated his belief that bronchial obstruction was essential in the production of abscess in the dog, irrespective of the organisms introduced.

Being unable to explain adequately the etiology of a large group of postoperative abscesses of the lung either by embolic or by bronchogenic inoculation acting alone, Van Allen and others [30] tested experimentally the effect of a combination of these two avenues of inoculation of the lung. They found that embolic abscesses of the lung could be enhanced in virulence and chronicity by insufflation of infectious material into the bronchus. They expressed their belief that this combined inoculation may explain the pathogenesis of the obscure group of postoperative pulmonary abscesses.

In another article the same authors [31] directed attention to the facts that abscess develops much more readily from emboli than from intrabronchial inoculation of the lung, and that the lung appears to be, in general, much more resistant to necrosis and suppuration than are other tissues. From their experimental studies, they concluded that the following proposition is correct; namely, that the greater vitality of the lung in pyogenic infections is due mainly to a greater blood supply, and that elimination of the pulmonary circulation, as by embolism, reduces the blood supply and tissue vitality to the common level.

PULMONARY ATELECTASIS

The outstanding contribution to the subject of atelectasis of the lung is Bowen's [32] article. As stated by the writer, his "paper exploits no new facts. It is simply an attempt to dust off, rehabilitate and show the value of paraphenalia that most clinicians have cast into a neglected corner." The subject is well presented and should be read not only by those who are interested in pulmonary atelectasis but also by those who do not have a clear conception of this remarkable phenomenon. A complete bibliography of the entire subject is given.

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30. Van Allen, C. M.; Adams, W. E., and Hrdina, L. S.: Bronchogenic Contamination of Embolic Abscess of the Lungs, Arch. Surg. **19**:1262 (Dec.) 1929.

31. Van Allen, C. M.; Adams, W. E., and Hrdina, L. S.: Embolism in Bronchogenic Infection of the Lung, Arch. Surg. **19**:1279 (Dec.) 1929.

32. Bowen, D. R.: Acute Massive Collapse (Atelectasis) of the Lung, Am. J. Roentgenol. **21**:101 (Feb.) 1929.

Additional evidence has been furnished by Lee and his co-workers [33] to corroborate their previous studies; namely, that pulmonary atelectasis can be experimentally produced if a bronchus is completely occluded by material removed bronchoscopically from a patient with atelectasis or by the use of some synthetic preparation. The most important criterion in this work is abolition of the cough reflex. In their earlier experiments performed on dogs, the cough reflex could not be satisfactorily controlled, and the results were unsatisfactory. The intraperitoneal introduction of sodium iso-amyl ethyl barbiturate has produced ideal conditions associated with absolute abolition of the cough reflex. This evidence, they stated, is of especial significance, both experimentally and clinically.

In conjunction with their studies of postoperative pulmonary atelectasis, Coryllos and Birnbaum [34] carried out extensive experimental studies to prove that lobar pneumonia must be considered as a variety of obstructive atelectasis of the lung. Considerable experimental data were furnished, and the question was thoroughly presented from the standpoint of etiology, pathogenesis and pathology, clinical evolution, roentgen observation and diagnosis. In conclusion, they considered lobar pneumonia as an "infectious (generally pneumococcic) lobar atelectasis of the lung," and bronchopneumonia as an infectious patchy atelectasis. They showed that postoperative massive atelectasis, postoperative pneumonia and "lobar pneumonia" have a similar pathogenesis and evolution, and similar clinical and roentgen signs. Bronchoscopic treatment, which has given encouraging results in massive atelectasis, has been suggested and applied to cases of lobar pneumonia in man. The number of these cases is, however, too small to allow definite conclusions to be drawn from them.

On the basis of experimental and clinical studies, Coryllos [35] was convinced that postoperative atelectasis and postoperative pneumonia represent two phases of the same pathologic process. He stated the belief that the pneumonia may follow the atelectasis. The dominant factor in the postoperative condition of the lung is bronchial obstruction and impairment of the free bronchial drainage. The fate of the parenchyma of the lung after bronchial obstruction depends on the bacteria in the obstructing mucus. A nonvirulent type IV pneumococcus will produce atelectasis; a more virulent organism, pneumonia,

33. Lee, W. E.; Tucker, G.; Ravdin, I. S., and Pendergrass, E.: Experimental Atelectasis, Arch. Surg. **18**:242 (Jan.) 1929.

34. Coryllos, P. N., and Birnbaum, G. L.: Lobar Pneumonia Considered as Pneumococcic Lobar Atelectasis of the Lung: Bronchoscopic Investigation, Arch. Surg. **18**:190 (Jan.) 1929.

35. Coryllos, P. N.: Postoperative Apneumatosis (Atelectasis) and Postoperative Pneumonia, J. A. M. A. **93**:98 (July 13) 1929.

and pyogenic and anaerobic organisms, pulmonary suppuration or gangrene.

Anatomy of the Tracheobronchial Tree.—Davis'[36] studies of the variations of the normal tracheobronchial tree are of particular interest to bronchoscopists as they are able to see many of these variations in the living subject. Davis found that in the right apical lobe the bronchus more commonly divided into two secondary bronchi and not three as usually described. Many variations were noted with regard to the size and length of the bronchus before division, also as to the angle at which branches were given off. The middle lobe bronchus presented variations which were still more marked. It appeared either as a lateral, a posterior or an anterior branch: in a number of instances, two separate branches supplied the lobe. In the right lower lobe bronchus, division into two or three branches occurred about equally. It was impossible to classify the divisions beyond this point because of the number of branches. The cardiac bronchus, which is usually given off between the orifice of the middle lobe bronchus and the division of the lower lobe bronchus, was the only bronchus found arising on the mesial side of the primary bronchus.

In the left apical lobe, the divisions were not unlike those on the right side. The size of the bronchi varied considerably, but the distance before branching was uniform. In the left lower lobe, the bronchus more often divided into three branches than into two.

FOREIGN BODIES IN THE AIR AND FOOD PASSAGES

In emphasizing that the function of the roentgenologist is chiefly diagnostic, Manges[37] observed that this involves not only the actual diagnosis of the presence or absence of a foreign body, but in the positive cases a description of the safety-pin, its size, the distribution of its parts, its physical characteristics and conditions, its effect on surrounding tissues, its variations or progress from day to day when not immediately removed and the anatomic characteristics of the patients. A roentgen diagnosis cannot be depended on unless the study includes the entire area of the alimentary and respiratory tracts, all clothing and other possible containers of foreign bodies having been removed.

Most types of foreign bodies have a tendency to lodge in some special part of the body; however, safety-pins may lodge in any portion of the alimentary or respiratory tracts. Above the level of the larynx the question of differential localization does not enter; below

36. Davis, J. D.: Anatomic Variations of the Normal Tracheobronchial Tree, Arch. Otolaryng. **9**:404 (April) 1929.

37. Manges, W. F.: Roentgen Observations on Safety-Pins as Foreign Bodies, Arch. Otolaryng. **9**:245 (March) 1929.

this, however, the foreign body must be specifically localized. A safety-pin in the larynx or trachea usually is found with its branches in the sagittal plane, while in the esophagus the plane is coronal. To assist in localization, the roentgenograms should be of such quality as to show the shadow of the larynx and trachea in sharp detail, both anteroposteriorly and laterally. If the pin is at the level of the tracheal bifurcation, it may be necessary to have the patient swallow a bismuth mixture to aid in establishing its true location. To demonstrate the actual size of the pin and the distribution of its parts, certain technicalities with regard to distance and to length of exposure are important. With perfect roentgenograms one can match pins with the shadows and often determine the exact type and size of the pin. Data regarding the thickness of the wire, the size of the wings of the keeper, the size of the spring coil and the presence or absence of a spring clamp should be secured.

Manges expressed his belief that the bronchoscopist should study the films with the roentgenologist to appreciate more fully these variations rather than depend on a mere description. In rendering fluoroscopic aid, the bronchoscopist must not expect undue help from the roentgenologist and should know whether tissue is included with the grasp of the pin. The roentgenologist should not be responsible for failures or accidents over which the bronchoscopist has control.

In addition to presenting a detailed report of 100 consecutive personal cases of foreign bodies in the air and food passages, Aucoin [38] gave the results of a statistical review of 1,000 successive foreign bodies removed at the Chevalier Jackson Bronchoscopic Clinic. These were distributed as follows: 99 in the pharynx; 440 in the esophagus; 11 in the larynx; 55 in the trachea; 377 in the bronchi, and 18 in the stomach. Of the bronchial foreign bodies, 65 per cent were in the right bronchus, and 35 per cent in the left. Foreign bodies of vegetal origin constituted 23 per cent of the total number, coins 15 per cent and safety-pins 12.2 per cent, so that these three groups made up 49.2 per cent of the foreign bodies in a consecutive series of 1,000 cases.

Statistics further show that about 25 per cent of the foreign bodies occurred in adults and 75 per cent in children. Further analysis of the age ratio indicated that of the safety-pins and vegetal foreign bodies, which constituted 38 per cent of the total number of cases and which are the most difficult type of foreign body to remove, 69 per cent were encountered in children under 2 years of age. Of the author's 100 cases, 43 occurred in children less than 2 years of age.

38. Aucoin, E. L.: Peroral Endoscopy: Report of a Consecutive Series of One Hundred Foreign Bodies in the Air and Food Passages, Arch. internat. de laryng. **8**:513 (May) 1929; 640 (June) 1929.

These observations lead to the inevitable conclusion that the endoscopist must use small tubes and must be equipped with a complete instrumentarium adapted for use in small patients. With careful and systematized training in this work the results are uniformly excellent; in fact, the mortality rate in the group of 1,000 cases was less than 2 per cent, while in the group of 100 cases there was no fatality. The general principles underlying the diagnosis and treatment are emphasized.

Foreign Bodies in the Esophagus.—In a review of cases of foreign body, Liu [39] found that esophageal foreign bodies are much more frequent among the Chinese than are foreign bodies in the air passages. The outstanding reason for this, he stated, is the fact that physicians, as well as the laity, understand the symptoms following esophageal obstruction by a foreign object. They do not, however, recognize the symptomatology of foreign bodies in the air passages, and it is a question whether they appreciate that foreign bodies can be inhaled. Among the esophageal foreign bodies, dentures and date stones are probably those most commonly observed. Economic conditions are largely responsible for neglect of dentures which are either ill fitting or broken. Date stones have sharp ends, which is probably the reason why they are found transfixed in the esophagus. Penetration of the esophageal mucosa and periesophageal abscess are not of uncommon occurrence. In five cases of esophageal obstruction by a date stone, two had extensive periesophageal infection with abscess formation.

After discussing certain features of the endoscopic work carried out during the past four years, Negus [40] agreed that for success in removal of foreign bodies from the bronchi, frequent practice in bronchoscopy is required and can be obtained only by the treatment of patients with lung suppuration, combined with practice on dissected lungs, rubber tubes and anesthetized animals.

A definite diagnosis of the presence or absence of a neoplasm of the lung can almost always be made by bronchoscopy. A simple new growth can be removed, even from a secondary bronchus. Abscesses of the lung, if in an early stage, can be cured by bronchoscopy. Bronchoscopic aspiration of pus-containing cavities in the lungs should be tried in all cases that do not respond to ordinary medical treatment; the use of drugs and postural drainage should always be combined. Bronchoscopy alone should not be continued if unsuccessful; the patient should be referred for thoracoplasty or other external operation.

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39. Liu, J. H.: Foreign Bodies in the Esophagus, China M. J. **43**:556 (June) 1929.

40. Negus, V. E.: Peroral Endoscopy, Lancet **2**:60 (Jan. 12) 1929.

With regard to coins in the esophagus, Negus expressed the belief that an anesthetic causes a child a great deal more fear and discomfort than does the removal of the foreign body, which can be accomplished in a few seconds if the operator and his assistants are well practiced.

Foreign Bodies in the Air Passages.—Cases of foreign bodies lodged in the larynx or upper trachea are often treated as cases of diphtheria. Isolation of these patients usually terminates the studies necessary in a case of foreign body, and too often this phase of the history is soon forgotten. Miller's [41] case is typical. While eating meat from a bone, a girl who had developed an acute cold suddenly choked, screamed and then completely lost her voice. A diagnosis of laryngeal diphtheria was made; this was changed to laryngitis when the history of eating the meat was discussed. After a few days, diphtheria antitoxin was given and the patient was sent to a hospital for contagious disease. After two weeks, the patient was discharged; however, the breathing was "bad," and she had a cough which was "due to bronchitis." This condition continued for a number of weeks, with an increase in the cough and difficulty in breathing. It was then diagnosed as spasmodic croup. Ultimately it was suggested that an endoscopic examination be made. By direct laryngoscopy a bone was found lying in the sagittal plane of the trachea, immediately below the level of the vocal cords. Following removal of the foreign body, the symptoms promptly cleared up.

Although in the following cases removal was not effected by endoscopic means, there were foreign bodies in the air passages; the unusual outcome of the cases was such that it was believed of interest to include them in this review.

Certain foreign bodies, notably grasses, such as timothy heads, frequently set up severe reactions in the pulmonary tissues; long-standing cases are commonly complicated by empyema. In the following case, reported by Larget and Lamare,[42] a spike of oat grass was aspirated by a child, aged 2 years. There was a brief period of suffocation at the time of the accident. Following this bronchitis persisted, and an abscess of the lung developed. The process later involved the thoracic wall, and the foreign body was ultimately discharged.

Perforation of the pleura by a foreign body in the absence of manipulation is of rare occurrence. This is especially true if the foreign body is of vegetal origin. Graham's [43] case is remarkable in this respect. A child, aged 8 months, secured a branch of cedar and placed it in

41. Miller, J.: A Tracheal Foreign Body Simulating Diphtheria, Am. J. Dis. Child. **38**:95 (July) 1929.

42. Larget, M., and Lamare, J. P.: Migration of Spike of Oat Grass Through Respiratory Organs, Bull. et mém. Soc. nat. de chir. **55**:26 (Jan. 19) 1929.

43. Graham, H. B.: Perforation of the Pleura by an Inspired Foreign Body: Report of Case, California & West. Med. **30**:120 (Feb.) 1929.

her mouth. It was believed that the cedar was swallowed and not aspirated, as the child seemed normal. She continued so for two and a half days, when suddenly she developed shortness of breath and distress. A roentgenogram of the chest indicated a total collapse of the left lung. There was nothing to suggest a foreign body. A bronchoscopy performed on the fifth day after the accident was negative for a foreign body. The signs were typical of pneumothorax. Two days later, fluid was aspirated from the left side of the chest, and on the eighth day following the accident the child died. At autopsy, the left lung was found totally collapsed; fluid filled the left pleural cavity. There was a perforation of the visceral pleura over the left lower lobe; nearby was found a branch of green cedar. Perforation of the pleura evidently had occurred two and a half days after the accident.

Sudden death from asphyxia due to occlusion of the larynx by a previously aspirated foreign body occurs with sufficient frequency to warrant its consideration as a possibility in any case of tracheobronchial foreign body of considerable size. One would hardly consider intestinal parasites in the category of tracheobronchial foreign bodies. The case by Dixey [44] is of interest in this connection. A child, aged 8½ years, suddenly fell, gasping for breath, became unconscious and died within a few minutes. There was nothing to suggest the cause. At autopsy, when the larynx was removed, two large, round worms were found; on closer inspection, one was seen to be partially curled up in the larynx, and between the two of them the laryngeal lumen was completely occluded, preventing respiration. Death resulted from asphyxiation. Additional worms were found in the stomach and the small intestines.

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44. Dixey, M. B. D.: Sudden Death Due to Occlusion of Larynx by Two Ascarides Lumbricoides, Edinburgh M. J. **36**:111 (Feb.) 1929.

News and Comment

LARYNGOLOGICAL SECTION OF THE ROYAL SOCIETY OF MEDICINE

Dr. E. Watson-Williams, Bristol, England, has been invited to collect cases of papillary granuloma of the larynx, with special reference to its occurrence after exposure to mustard or other irritating gases, for presentation at the June Session of the Laryngological Section of the Royal Society of Medicine.

He would be grateful for any notes of cases of this rare condition, illustrations and microscopic slides especially, or any references to published cases or to occurrence apart from war service.

Special points of note are: (1) signs and symptoms, clinical appearances; (2) date of exposure to and nature of gas; (3) latent period, if any; (4) operative measures, exact site of granuloma and pathologic report; (5) examination of blood or sputum for syphilis and tuberculosis; (6) subsequent history.

Communications should be addressed to Dr. E. Watson-Williams, Royal Infirmary, Bristol, England.

COURSE IN OTOLARYNGOLOGY AT UNIVERSITY OF BORDEAUX, FRANCE

Prof. Georges Portmann plans to give a special five weeks' course at the University of Bordeaux, France, for students in otolaryngology, beginning July 21, 1930. For further information apply to Dr. Leon Felderman, Mitten Building, Philadelphia.

Abstracts from Current Literature

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PNEUMATIZATION OF MASTOID PROCESS AND MUCOSIS OTITIS. H. RICHTER, Ztschr. f. Hals-, Nasen- u. Ohrenh. **25**:74 (Nov. 14) 1929.

Richter reports that in 208 of 225 patients in whom operation for mastoid infection or its complications had been made, bacteriologic and roentgen examinations had been effected. In 38.2 per cent *Streptococcus mucosis* was found. There was a preponderance of male patients. In thirty-seven subjects (40.7 per cent) an infection of the upper respiratory tract had preceded or was coincident with the condition. There were only four bilateral infections, forty-eight on the right and thirty-four on the left side. In forty-nine patients (57 per cent) complications were noted. Eight patients died; however, in two death was due to an intercurrent infection; the mortality was therefore 7 per cent. The condition of pneumatization of both mastoid processes was almost equal forty-two times (in 71.2 per cent) but appeared slightly inhibited in fifteen patients; in seventeen it was inhibited on one side only (28.8 per cent); in ten patients this was the afflicted side. On the basis of his experience Richter notes that *Streptococcus mucosis* was approximately equally prolific on the pneumatized and nonpneumatized mucous membrane.

NYSTAGMUS DUE TO VASOMOTOR DISORDERS. O. MUCK, Ztschr. f. Hals-, Nasen- u. Ohrenh. **25**:88 (Nov. 14) 1929.

On the basis of an experimental study on forty normal subjects and on five deaf persons with deficient development of the ear labyrinth, Muck concludes that the rôle of vasomotor influence is considerable in development of diseases of the middle ear. Nystagmus coincident with a paling phenomenon may be observed after caloric irritation or by injection of epinephrine in normal subjects; this does not occur in those without a labyrinth. The head of the tested subjects was turned; this had given rise to transitory stretching of the vertebral artery which, according to Muck, is responsible for assisting in production of the syndrome.

FIBROMA OF COCHLEAR NERVE WITHOUT INJURY TO AUDITION. E. SCHLITTLER, Ztschr. f. Hals-, Nasen- u. Ohrenh. **25**:104 (Nov. 14) 1929.

Schlittler's patient, aged 47, had been hospitalized for severe symptoms of purulent bronchitis and an aneurysm of the aorta. Examination of the ear had not disclosed any disorder; however, at necropsy, an extensive tumor with clearly defined limits was found in the right inner ear. Microscopic examination of the tumor showed that it belonged to the slowly growing type and had not caused destruction but had gradually displaced the cochlear nerve.

GRADENIGO'S SYNDROME: ROENTGEN EXAMINATION OF ABSCESS IN MASTOID PROCESS. M. BIGLER, Ztschr. f. Hals-, Nasen- u. Ohrenh. **25**:249 (Jan. 25) 1930.

Bigler points to the importance of combining clinical examination with roentgenography for early diagnosis. On the basis of the results reported in the literature and his personal experience in one case, he concludes that inflammation of the mastoid process is more frequent than has been noted heretofore. Neuralgia of the trigeminus nerve occurring after an otitis of several weeks' duration warrants thorough examination by roentgen rays, thus indication for operation may be disclosed at an early stage of the disease.

TRANSITORY HYPACUSIA AFTER CALORIC IRRITATION OF THE EAR LABYRINTH. O. MUCK, Ztschr. f. Hals-, Nasen- u. Ohrenh. **25**:262 (Jan. 25) 1930.

On the basis of experiments on ten physicians and two other subjects with normal acuity, Muck states that after caloric irritation of the ear labyrinth a transitory hypacusia occurs which can be tested with the tuning fork C5. The hypacusia is on the same side if the ear has been rinsed with cold water, it is on the opposing side coincident with a vasomotor reflex action if hot water was used. It is possible that a cramp in a branch of the cochlear nerve is the cause of this reaction.

EFFECT OF TOBACCO AND TOBACCO SMOKE ON ACOUSTIC ORGAN AND VESTIBULE OF THE EAR. F. LICKINT, Ztschr. f. Hals-, Nasen- u. Ohrenh. **25**:312 (Jan. 25) 1930.

After discussing the data obtained from the literature, Lickint comes to the following conclusions: Tobacco or tobacco smoke may give rise to an increased formation of cerumen in the external canal of the ear. Catarrhal infections originating in the nasopharynx often extend into the eustachian tube and from there penetrate into the tympanic cavity and involve the tympanic membrane. As a result, the tube may become blocked and through the constant chemical and mechanical irritation a chronic otitis media may develop. Secondary infections can occur by introduction of bacteria with tobacco particles and acute purulent otitis media can result. Toxic manifestations in the cochlear nerve are frequently noted and nervous disorders (otalgia) may be caused by nicotine. The membranous labyrinth may be injured by nicotine sclerosis of the blood vessels. Experimental proof of the extensive involvement caused by nicotine is in existence, and diseases such as Ménière's disease, vestibular nystagmus and labyrinth vertigo can result.

Pharynx

ETIOLOGY OF ADENOIDS: STATISTICAL INVESTIGATION. E. SAARESTE, Monatschr. f. Ohrenh. **63**:824 (Aug.-Sept.) 1929.

In 1,366 school children from Tartu (Dorpat), Esthland, Saareste examined the relative extent of the tonsils by means of pharyngoscopic and post-rhinoscopic methods. Adenoids were evident in 659 children (48.2 per cent); 459 had minor growths (33.6 per cent), in 148 children (10.8 per cent) the vegetations were of medium size; in 52 (3.8 per cent), large adenoids were seen. Hypertrophic tonsils were seen in 430 children (31.5 per cent). Three hundred and twelve children (22.8 per cent) had adenoids and hypertrophic tonsils. Spontaneous involution of the adenoids occurred in general at the beginning of puberty (about 13 years of age) but was observed to a slight degree at 10 years. Children from poorer classes had larger adenoids than those in higher schools. Fifty-two and three-tenths per cent, or 429 children having adenoids lived in the city, whereas 42 per cent, or 230, were country bred. Of especial interest was the fact that large adenoids were found in 5.4 per cent of the city children, but in only 1.6 per cent of the country children. There was no evidence that scarlet fever or measles had had any influence.

Larynx

SENSORY INNERVATION OF THE LARYNX. G. HOFER, Monatschr. f. Ohrenh. **63**: 1277 (Dec.) 1929.

Hofer discusses this problem on the basis of experimental exclusion of the laryngeal nerve in eight patients and a review of the literature. His pictures illustrating the anatomic structure are clear, and an abstract without them therefore loses in value. As a result of his study, Hofer states that the superior laryngeal nerve is sensory from the entrance of the pharynx to the lower portion of the vocal cords. Its branches, however, are chiasmic and reach into the hypoglottis

where they constitute a bilateral innervation. The lower laryngeal nerve is not only a motor nerve but a mixed nerve. It gives off its sensory innervation to the lower (hypoglottis) part of the larynx as far as the third or fourth segment of the trachea reaching up toward the vocal cords. Also here the fibers are chiasmic and carry out the function of bilateral innervation. Beyond this point the inferior laryngeal (recurrent) nerve reaches up above and beyond the vocal cords, although not so abundantly as the superior laryngeal nerve branches out from above. The larynx is thus enclosed by all four branches of the vagus nerve in a sensory network. The fibers of both sides as well as those from the upper and lower nerves are partially interlaced. Individual variations are noted in the form of unequal distribution of areas of anesthesia or restoration of sensibility after unilateral exclusion of a nerve; however, according to the author this gives additional proof for the extent of the vicarious innervation of the sensory laryngeal nerves in man.

ACUTE INFLAMMATORY EDEMA OF LARYNX WITH DIPHTHERIA BACILLI. HÜBNER, Ztschr. f. Hals-, Nasen- u. Ohrenh. **25**:107 (Nov. 14) 1929.

On the basis of his personal experience in five patients with a positive culture and three with edema and sore throat but in whom no diphtheric bacilli were found, Hübner concludes that for development of true diphtheria several interacting factors are essential. In four other patients no cultures had been made, but identical symptoms were noted. The virulence of the bacilli is of equal importance as the appropriate environmental conditions. Failure of the organism to produce antibodies likewise favors the development of the disease. Hübner points to the resemblance of the symptoms in his twelve patients to erysipelas of the larynx. The characteristic temperature curve was not evident, however, and likewise the tendency of involvement of the trachea, pharynx or face was lacking. From a discussion of his observations the author concludes that the mucous membrane of the larynx can harbor diphtheria bacilli the toxin of which gives rise to edema without the formation of a pseudomembrane.

Nose

REGENERATION OF THE MUCOUS MEMBRANE OF THE NOSE AFTER SURGICAL INTERVENTION. D. N. MATWEJEW, Monatschr. f. Ohrendh. **63**:1293 (Dec.) 1929.

On the basis of his personal experience in twenty-five patients and a review of the literature, Matwejew stresses the importance of preserving intact, as far as possible, the physiologic functioning of the mucous membrane of the nose. In eight patients in whom thermocautery was done and in six others who had been treated with caustics, regeneration of the mucous membrane did not occur. On the contrary, its functional activity was inhibited, and a chronic catarrh resulted. Such radical treatment should therefore be made only when the glands and erectile tissue have already been destroyed by pathologic processes. After turbinectomy, which was done in six patients, healing occurred with the formation of a narrow scar as a result of fusion of the margins of the wound by connective tissue. The mucous membrane containing the glands and the erectile tissue had been kept intact. The author advises performing turbinectomy rather than cauterization in all cases in which complete degeneration of the mucous membrane has not yet occurred.

TREATMENT OF CHRONIC CATARRHAL RHINITIS AND HAY-FEVER WITH EPHEDRALIN-MERCK (AN EPHEDRINE COMPOUND). E. FISCH, Monatschr.f. Ohrenh. **63**: 1313 (Dec.) 1929.

Fisch reports that in nineteen of twenty patients (the clinical histories of three typical cases are described) treatment by injection of preparations of synthetic ephedrine and epinephrine was successful. There were fourteen patients suffering

from chronic catarrhal rhinitis, five had hay-fever and one a condition of epiphora. That the injection is given only subcutaneously and that the surface of its distribution is as large as possible should be noted. Transitory symptoms of perspiration, feeling of cold, tremor and paresthesia are sometimes noted at the site of injection and can be controlled by advising the patient to rest for several minutes after the injection. Fisch stresses the fact that hypertonia or a leaning toward hypertension is contraindicative to this treatment, and he points to the importance of recognition of pathologico-anatomic conditions demanding operative intervention before medication.

Mold Fungus Disease of Maxillary Sinus. M. Mollari, Ztschr. f. Hals-, Nasen- u. Ohrenh. **25**:65 (Nov. 14) 1929.

Mollari reports the rare incidence of a mycosis in the maxillary sinus of a woman, aged 74, in whom a tentative diagnosis of a malignant tumor had been made. On microscopic examination the presence of an almost pure culture of fungi resembling *Aspergillus niger* was noted. The author believes a genus of ascomycetous fungi to have caused the disease and points to the importance of considering the possibility of fungal infection and of making cultures accordingly before fixation of tissue removed for examination.

Transitory Amaurosis in Local Anesthesia of Septum. E. Levy, Ztschr. f. Hals-, Nasen- u. Ohrenh. **25**:245 (Jan. 25) 1930.

In Levy's patient, aged 16, injection of a solution of cocaine and epinephrine in preparation for operation of a deviated septum had caused this accident. The patient complained of severe pain in the left eye shortly after the injection, coincident with complete blindness, and the operation had to be postponed. Levy reviews the literature and concludes that amaurosis can occur if the pressure of the injected fluid is too great coincident with anomalies in development of the arteries. If the injected substance is easily absorbable, the amaurosis is transitory as it was in his patient; however, if a substance such as paraffin is injected, a permanent injury to the eye can ensue.

Society Transactions

COLLEGE OF PHYSICIANS OF PHILADELPHIA, SECTION ON OTOLOGY AND LARYNGOLOGY

Oct. 18, 1929

GEORGE M. COATES, M.D., *Chairman*

SOME PROBLEMS IN OTO-RHINO-LARYNGOLOGY. HERBERT TILLEY, B.S., London.

It would be difficult for me to express how keenly I appreciate the honor of being the guest of this section this evening and of having been invited to address an audience composed of so many distinguished physicians in our particular branch of medicine. The task of preparation has been difficult and would have been still more so had you not given me permission to ramble where fancy might lead me, even if this should involve some retrospects of a pilgrimage of nearly thirty-five years.

In the early days of that period I saw and, I hope, shared in the successful struggle for the recognition of diseases of the ear, nose and throat as a special department of medicine, and for its being placed on an equal footing with obstetrics, psychiatry and those other branches of our art and craft which require special and prolonged training. Today practically every large hospital in Great Britain has its ear and throat department, and many of the smaller hospitals in country towns and districts have arrangements whereby they can obtain the services of an expert whenever necessary. Furthermore, a Bachelor of Surgery of the London University can take the degree of Master of Surgery in otorhinolaryngology, and a special diploma in these subjects may be obtained, under certain conditions, by a member of the Royal College of Physicians and Surgeons.

In other universities, i. e., Edinburgh, similar facilities are offered to graduates who have taken up the study of particular subjects.

If time permitted, I could tell you who live in this comparatively young and enlightened country some astounding stories of the difficulties we encountered in gradually overcoming the conservatism, the vested interests and often the jealousies of those to whom tradition and precedence were as the breath of life.

Otology.—As otology is the senior member of our triology, I shall consider one or two of its problems that often confront us in our daily work. Before doing so, however, I should like to interject one or more retrospects. When I graduated in 1890, my teachers occasionally performed a cortical mastoid operation and left the postaural wound widely open. This was packed daily for from six weeks to two months until the wound had healed. I remember one patient who was allotted to me when I was "dressing" for my chief, and that patient is now Surgeon-Admiral of the British Fleet. If the complete tympano-antral operation was performed, no meatal flap was cut and the postaural wound was dressed in the way I have already stated. You will realize the tedium such after-treatment inflicted on both the patient and the surgeon.

In 1886, the first successful operation on an otogenic abscess of the brain was performed in University College Hospital by the late Arthur E. Barker, who was then one of the assistant surgeons of that institution.

Practically nothing was known in those days with regard to labyrinthine tests in health and in disease, and consequently the medical or surgical treatment for inflammatory lesions of the internal structures of the ear scarcely existed.

The symptom-complex which is spoken of as Ménière's disease was, of course, well known to physicians, and one of my teachers, Sir William Gowers, maintained that vertigo was of aural origin in 90 per cent of cases.

The late Mr. Mark Hovell, aural surgeon to the London Hospital, was more explicit as to the nature of the ear lesion and recorded that most of his patients who consulted him for vertigo suffered from postnasal catarrh, and as this could be relieved or cured, the attacks of giddiness would be minimized in their frequency and severity. Many of us who were his juniors have since then amply proved the correctness of his observation.

In the early part of this year, Mr. Sidney Scott (*Proc. Roy. Soc. Med.*, 1929) again upheld the same view, and said that the largest class of recurrent vertigo is "associated with inefficiency of the eustachian tube mechanism."

Let me give you two illustrative examples; both of the patients are medical friends of mine, and this is what they have written to me:

"Dr. M. T. was seen by me in August, 1925, for attacks of vertigo similar to those which he had had for thirty years previously and about the time of puberty. Since then the attacks were more frequent in the summer, but for the last two years there had been no seasonal incidence. The general health was good and he was never 'off work.' He says, and this is significant: 'I am usually able to avert a bad attack by a gentle valsalvian insufflation.'"

My second friend sent me the following more detailed account of his attacks:

"In June, 1928, I had an attack of giddiness, during the first day of which I vomited several times. Dr. James Collier kindly visited me twice when I was at my worst, but he found, I believe, no objective phenomena. I was not confined to bed although I was on a couch most of the day. I was considerably troubled by loss of co-ordination in my legs; I dreaded passing the stairs to my basement, and was troubled in crossing the pavement between my car and the house I was visiting.

"The attack ended in a dramatic manner after I had been ill for about a month. One afternoon I reached home about 5 o'clock, sat down in an armchair with a daily paper and fell asleep. The extension telephone in my bedroom rang, and I jumped up and went to it. As I passed a looking-glass, I noticed that my face was very pale. After answering the phone. I fell upon the bed, and laid there for a few minutes. When I got up my giddiness and loss of co-ordination had completely disappeared.

"From then until Feb. 1, 1929, I was well. On February 1, I had a busy day and got home for an appointment at 5:15 p. m. I saw my patient out at 6 o'clock and immediately became giddy and vomited. I went to bed feeling very ill, I was giddy and vomited frequently. I had intense photophobia; the slightest ray of light made me vomit. I could not bear the light from the gas fire and a screen was placed round my bed to keep out the light from the street lamps, etc., although the windows have venetian blinds and curtains.

"On the following day (Saturday), Dr. Gordon Holmes visited me twice. I was vomiting when he arrived at 9 a. m. He gave me a mixture of sodium bromide, chloral and prussic acid, and the vomiting ceased. He told me that I had well marked nystagmus. I remember nothing more about that day except that I lay with my head under the bed clothes because of the light, and I had complete anorexia.

"The whole attack passed off in a few days after which a friend kindly put her car and chauffeur at my disposal. I used it for about a month and then took out my own car.

"Only once since have I had any sign of the sickness and it only lasted half a day.

"My vertigo was, with the exception of the February attack, only slight, everything was on the move.

"My wife and daughter told me that they knew when I was unusually ill, by my pallor.

"I am not a bilious subject, am never troubled by constipation and I never vomit. I have never suffered from any ear trouble. I had no pain.

Aug. 29, 1929. G. W. I."

In this interesting clinical account of my friend, one notes the recurrence of visual and gastric disturbances and the cardiovascular symptoms of pallor and collapse. These were not the causes of the vertigo but, as Sidney Scott said, they must be regarded as "secondary reflex results of the excessive stimulation of the vestibular centers in the medulla."

On my return from vacation, the second patient came to me, still feeling rather unsteady, but with deafness in the right ear as his chief complaint. The ordinary tests showed the condition to be of middle ear origin. I inflated his tubes and the effect was dramatic, for the hearing immediately returned, the dizzy feeling disappeared and he walked out of the room in high spirits and with the greatest assurance. There has been no recurrence of the vertigo.

In both patients it is clear that this symptom was caused by occlusion of one of the eustachian tubes. And how serious it may be in air pilots and in the personnel of submarines. I have often wondered whether vertigo may not account for some of the deaths from drowning during the holiday seasons, i. e., a sudden attack of giddiness with possibly a cardiovascular disturbance due to water entering one eustachian tube, rather than to the so-called "muscular cramp."

Before leaving the subject of vertigo, I should like to mention those cases in which Ménière's syndrome is caused by an abnormally low blood pressure, rather than by a high arterial tension with which all are familiar. My colleague in the Royal Ear Hospital, Mr. Richard Lake, was, I believe, the first to draw attention to this factor. One of my patients was an elderly woman who for months was almost bedridden by frequent and severe attacks of vertigo. Bromides and the other usual remedies failed to give relief but an ergotine preparation would almost immediately cure an attack, and when this treatment was followed by cardiac tonics the patient resumed the ordinary quiet routine of her daily life. But she always kept this preparation at hand.

Coming to chronic suppurative lesions in the cleft of the middle ear, I should be glad to know your experiences in the surgical treatment for attic suppuration, i. e., are you in favor of ossiculectomy or do you find that a conservative operation on the mastoid is the better procedure? My experience would seem to show that the main cause of chronicity lies in the infected antrum or in its adjacent mastoid cells and that a postaural operation is more likely to cure the discharge from the attic and to conserve whatever hearing there may be in the affected ear.

Again, what has been the experience of those of you who have tried immediate closure of the wound after a simple, or Schwartze, operation on the mastoid, whether for acute, subacute or possibly chronic suppuration?

About twelve or thirteen years ago I showed before our Section of Otology of the Royal Society of Medicine, five consecutive cases in patients in whom the method had been adopted with success. In one of them a perisinus abscess had been present. The technic included the removal of every visible focus of infection, the application to the bone wound of hydrogen dioxide solution, then of methylated spirits and finally a free application of bismuth and iodoform suspended in liquid paraffin. After insertion of the skin wound sutures, pressure is applied to the wound in order to squeeze out as much of the bismuth and iodoform paraffin mixture as possible.

The longest time any of these patients was in the hospital was sixteen days, an enormous saving of time compared with the usual requirement. I have had no fatal result or any complication more serious than the recurrence of discharge in a few patients which necessitated the opening of the lower part of the wound to provide for drainage until the usual obliteration of the wound by granulation tissue took place.

The patients who do best are those in whom the suppuration has been present for from five to six weeks, and therefore I presume that some protective immunization has been secured. In two acute cases the edema over the mastoid process was

one-half inch (1.27 cm.) thick, and yet the patients did well and the wound healed by immediate union. The method has been successfully adopted by Guthrie of Edinburgh, by McNab of Johannesburg and by others, but it was not so generally adopted as one might have expected by those whose asepsis and surgical technic are of the highest order. One is quite aware of all the theoretical objections against immediate suture, but by practical experience they appear to be possibilities rather than probabilities. I was encouraged to adopt the method because of the successful result that followed the bismuth, iodoform paraffin paste in the treatment for wounds during the World War.

I should now like to record a case which is unique in my experience, one of pyemia of aural origin without sinus thrombosis. Körner of Frankfort-am-Main was the first to describe such instances and the late Henri Luc (Paris) published reports of two cases from his own practice; you will find them in his "Lectures on the Suppurations of the Middle Ear."

My patient was a finely built boy in one of our public schools. He had had an acute otitis of the left ear quickly followed by discharge. This ceased in a few days, but the temperature, instead of falling, increased in its daily excursions until, when I saw him some three weeks later in consultation with his medical attendants, the following conditions prevailed:

The tympanic membrane was normal, and the hearing was little inferior to that of the sound side. The soft tissues over the mastoid showed no sign of present or past inflammation, and deep pressure on that process elicited no discomfort; nor was there any tenderness or swelling over the course of the jugular vein. The patient felt well except when the evening temperature rose to from 102 to 104 F. He was cheerful to the extent of facetiousness, and said he was looking forward to a good dinner. The temperature chart was of the swinging type, such as one would expect in a patient with septic thrombosis of the lateral sinus. The urine was normal. No blood examination was made. On further general examination, I found a tender area over the symphysis pubis, another behind the left trochanter and another in the left gastrocnemius muscle.

It seemed, therefore, that my associates and I had to deal with a case of pyemia with distal foci of aural origin typical of those described by Körner and Luc.

A few days later, right pneumonic symptoms with pleurisy developed, and the boy died. To add to the tragedy, I may mention that he was an only son and captain elect of his school.

The pathologic process in such conditions is not clear, but the theory most in favor is that the pyemia results from minute septic thrombi in small veins of the mastoid process which pass through the pulmonary capillaries and find lodgement in distant regions. In lateral sinus thrombosis, the larger thrombi become lodged in the pulmonary vessels.

What should have been our treatment? I advised against exploration of the mastoid and lateral sinus because I knew that this had been done in other cases without finding any focus of infection, and that in two fatal cases, the pathologists found no evidence of mastoid infection or of sinus thrombosis. Furthermore, the literature on the subject clearly showed that if during the remissions of temperature, the general condition of the patient was good, recovery usually took place. And as I have said, there was no sign or suggestion of any mastoid or sinus complication.

I still think that I was right in not operating, but shall esteem any favorable or adverse criticism which you may care to offer, especially if such is the result of practical experience.

At the present time, I have a little boy under my care who has recovered from bilateral acute suppurative otitis media. The left mastoid was opened and found to be infiltrated with pus. His temperature still continued to rise every evening to from 102 to 103 F. for three weeks, at which time the left external rectus became paralyzed and the temperature rose to 104.8 F. and was accompanied by temporal headache. In the meantime, the discharge from the right ear had

ceased. The wound was explored and the apex of the petrous pyramid was searched for a possible cause of these symptoms, but without result except for the escape of a considerable quantity of serous fluid. Still the swinging temperature was maintained, but all the time since the commencement of his illness, during the remissions of temperature, the patient read story books, was interested in all that went on around him and was always ready for his food. The sixth nerve paresis is now quickly subsiding, his temperature has been practically normal for the last week and he is running about the ward. Was this a case of aural bacteremia as first described by Gruening of New York, which has been slowly overcome by natural processes? In view of the persistent septic type of temperature, the supervention of Gradenigo's symptom, and the temporal headache, was I right in making the second exploration? It was so difficult to stand by and do nothing in face of so many grave possibilities. Here again I invite any criticism born of your experiences, and ask whether you have found autogenous vaccines from blood cultures, subcutaneous injection of physiologic solution of sodium chloride or the internal administration of methenamine of any value. Blood cultures failed to show any organisms.

I wish to mention another small point of practical interest before leaving the subject of otology. Many years ago I had under my care, at surprisingly brief intervals, three patients with sarcoma (or endothelioma) of the nasopharynx, and in each patient an early symptom was deafness due to the accumulation of a viscid mucoid secretion in the tympanum, on the side corresponding to the primary nasopharyngeal lesion. Paracentesis, in such cases, naturally failed to give more than temporary benefit.

Further experience has led me to believe that this symptom is common and that its significance may easily be overlooked if one fails to examine the posterior nasal regions. Sir William Milligan has emphasized the same points.

Rhinology.—Chronic nasal catarrh is probably the commonest symptom for which patients consult the specialist. Its causes are to be found in the standard textbooks, but I should like to emphasize a few factors on which, I think, the authors do not seem to lay sufficient stress.

We all know that adenoids or adenoids and tonsils are the most frequent cause of chronic nasal catarrh in children, while a relatively small number may be due to an added sinus infection. The treatment for such conditions is obvious. But there is often more difficulty in curing the trouble in adult people, in whom such definite conditions do not exist. I would humbly suggest that one reason for our failure is that the posterior rhinoscopic mirror frequently does not reveal the fibrous and septic remains of old adenoids which digital examination or endorhinoscopy would detect.

Secondly, many intractable catarrhs are caused by secretions from polypoid degeneration of the antral mucous membrane. Hence my practice that if no obvious lesion be visible or palpable in the nasal passages, I puncture and irrigate the antrum, and as often as not the lotion brings away a large nummulation of mucus or mucopus. In mild cases a few irrigations followed by injections of 15 per cent mild silver protein will bring about a cure. If such fails to do so an operation to provide for free naso-antral drainage will often secure the desired result. It is surprising how often the antral mucous membrane undergoes polypoid degeneration without any sign beyond a chronic nasal catarrh.

I scarcely need dwell on the diagnostic value of injections of iodized oil into the antrum followed by roentgenography, especially when one antrum is affected by polypoid degeneration of its mucous membrane or when its lumen is invaded by a new growth.

Having spoken of a common nasal condition, may I give a brief account of a rarer condition, namely, aspergillosis of the maxillary antrum. One may find an account of it in the *Proceedings of the Royal Society of Medicine* (1914-1915, vol. 8, part 2), and I think it was the first record of the condition as observed in five patients.

The symptoms were violent sneezing, expulsion of grayish-white, semitranslucent, viscid lumps of mucus, headache and neuralgia around the cheek and eye, which in one patient was so severe as to prevent sleep. The nasal mucosa was pale and edematous, and the swelling was not reduced by the administration 20 per cent cocaine.

In two patients, the inner antral wall bulged into the nasal cavity. No fluid returned on attempted irrigation. In one case, the ethmoidal cells were involved.

On opening the antrums through the canine fossa, a bluish-gray mass presented itself, and on removal it proved to be a sticky mass resembling the contents of a muscatel raisin. The Caldwell-Luc operation was performed in each instance, and the trouble quickly disappeared after irrigation with warm physiologic solution of sodium chloride for about ten days.

The pathologic process underlying the condition was established by the late Prof. S. G. Shattock, who stated that the material consisted of a homogeneous matrix containing scattered spheroidal cells which in some regions were grouped into narrow lines and consisted of polymorphonuclear cells. A microscopic section resembled an endotheliomatous tumor of the salivary gland. In certain cases the viscid mass was permeated by a well developed mycelium which differed from that of thrush (*Blastomyces albicans*) in that its extension did not take place by constricted budding but by simple lateral extension of short processes of uniform diameter.

I should like to show you this unique specimen of osteomyelitis of the calvarium and also some slides sent to me by my friend, Logan Turner of Edinburgh, which show possible tracks of septic infection of the meninges which may follow operation on the ethmoid labyrinth.

It is historical in the sense that it was the first recorded case of its kind and followed an operation for bilateral suppuration of the frontal sinuses performed by me in 1899 (*Brit. M. J.*, 1899). Many extensive but superficial operations were performed in the hope of checking the spreading inflammation, but after nine months of suffering the patient died and the autopsy revealed foci of suppuration in many of the internal organs.

If one had the misfortune to meet with such a complication today, there would be no hesitation in exposing the whole frontal bone, and commencing on a healthy area well beyond that infected; the whole thickness of the bone would be removed, including the inflamed regions.

I know of only two precautions which may prevent or minimize the chances of such a complication, viz., to provide for free drainage from the operated sinus and in no circumstances to employ a curet for the removal of diseased mucous membrane, which can easily be done with blunt forceps or with wool firmly twisted on a probe.

Throat.—The mere mention of the region of the throat suggests that threadbare subject the tonsils. I can image you, Mr. President, rising in authority from your chair and saying, "I forbid." If you do so, no one will be more grateful than I, because only a few hours ago I raised some issues on the subject in Chicago, and, wondering how many enemies I might have made, I took the train the next morning, in my haste to reach Philadelphia, which from its name and all I have heard of it, deserves the distinction of the "City of Brotherly Love." One problem I did not mention in Chicago may perhaps be mentioned here. On the assumption that no tonsil can at any time be entirely free from pyogenic and possibly pathogenic organisms, what macroscopic and early clinical signs have we that it has reached a stage which renders it a possible focus of local or systemic infection?

Your colleague, Dr. G. B. Wood, has emphasized the pathologic significance of excess of polymorphonuclear cells in the crypts or making their way thereto through the epithelial cells that line those recesses. But the surgeon needs to find some early evidence of disease with the naked eye if he is to make a proper selection of patients for surgical treatment.

A slight enlargement of the tonsils is not necessarily a call for enucleation because it will frequently subside by the establishment of normal nasal respiration, e. g., marked septal deflection or moriform hypertrophies of the posterior ends of the inferior turbinates. Nor is the presence of physiologic débris in the tonsillar fossa necessarily a condition requiring surgical treatment. If it were so, "Who amongst us shall escape whipping?"

In this matter I would ask, how far has Dr. French's tonsilloscopy helped you?

Another point I would like to mention deals with the question of checking hemorrhage during and after tonsil operations. There are many well known operators in all countries who advocate stopping the bleeding by pressure of gauze swabs or sponges. I ask them or any surgical confrère, Why adopt a measure for arterial bleeding in a tonsil recess which would not be employed in any other accessible region of the body?

With a little practice one can find and ligature the chief vessels in a few seconds and leave the home or hospital with an easy mind. How can one do so when one knows that the strain of vomiting, or restlessness, may burst open an unsecured vessel? Let us think for a moment of the resulting anxiety for relatives, to say nothing of the additional suffering of the patient, and, maybe, the safety of his or her life, for which one has made oneself responsible.

That such is a common complication is proved by the flow of literature on the subject and the frequency with which instruments are being devised to avoid it. Of its possible seriousness, we, no less than the public, are aware. Let me read you what the experienced and shrewd observer, the late Mark Hovell, said on the subject eight years ago, on the occasion of the Summer Meeting of the Section of Laryngology, of the Royal Society of Medicine, London:

"It has often been stated that the hemorrhage which follows tonsillectomy is of but little consequence, but possibly opinions differ as to what is considered a serious extent. Rather more than a year ago I heard from a creditable source that a throat specialist had then had four deaths from hemorrhage following the enucleation of tonsils but since then I have not been in a position to hear of his more recent contributions to the cemetery. As regards the members of this Section, I will not refer to deaths but will merely mention that to my knowledge there is more than one of them who, following enucleation of the tonsils, has been confronted with hemorrhage to a degree which caused him grave anxiety."

In my own practice, by ligaturing the descending branch of the posterior palatine above, and often the tonsillar branch of the facial below, I have, in 1,000 carefully recorded cases, reduced my average of postoperative hemorrhage from 5 per cent to less than 1 per cent. One of my students has written that I am in the habit of saying, "You should ligature the vessels in every case whether it be in a man, woman, child or curate."

If I am too dogmatic on this point, it is because, as I have already said, we cannot have too great a regard for the safety and sanctity of lives entrusted to our care.

Laryngology.—As my friend, Sir St. Clair Thomson, has been blazing laryngologic trails through the United States, it is obvious that I need say nothing concerning malignant and tuberculous diseases of the larynx. However, I should like to show you two slides. The first is that of a larynx from which an epithelioma of the right vocal cord was removed, and you will note its healthy cicatrix. Thirteen years later I was called to see the patient because he was having great difficulty in breathing. He was practically moribund when I arrived, and died a few hours later. The larynx was removed, and you will see a growth on the left vocal cord from which a section was made. Another patient of mine, from whom I removed a primary epithelioma of the vocal cord, died fourteen years afterward from recurrence of disease, not in the larynx but in the scar of the skin incision, and infiltration of the adjacent regions quickly followed. A third patient died of cancer of the prostate seventeen years after the removal of a primary epithelioma of the vocal cord.

What do such recurrences imply? The late Professor Shattock once told me that he was of the opinion that during its growth, a cancer produced a certain degree of immunity, and after operation the patient would live (qua cancer) until such protection was exhausted. Then any cancer cells which had lain latent might become active again, either locally or in some more distant area. Had cancer cells lain dormant within the scar of my patient for fourteen years, until a lost immunity enabled them to become active again?

My second slide shows the transverse section of a normal vocal cord stained by Unna's acid orcein which shows the distribution of elastic tissue. It also enables one to define the true vocal cord as that portion which is covered by squamous epithelium. You will notice where this passes into the ciliated epithelium leading toward the floor of the ventricle on the upper surface of the cord, and to that of the subglottic region below.

A squamous epithelioma may develop only within the limits of the squamous epithelium. In the elastic region there are few mucous glands, and hence an adenoma of the true vocal cord is of rare occurrence.

Finally, a rare specimen of intratracheal, or to be more exact, tracheobronchial papillary granuloma may be of interest. I removed it from a healthy young man who had been gassed in the World War. From within a few hours of inhaling the mustard gas, he suffered from paroxysms of cough. In the course of a few weeks he complained of difficulty in breathing, and when he visited me the distress was painfully obvious. Laryngoscopic examination revealed a tumor in the lower end of the trachea which moved upward on expiration and downward on inspiration, a ball-valve type of obstruction and therefore suggesting a pedunculated and probably benign formation. I removed it by peroral tracheobronchoscopy the next day. It was attached to the left main bronchus just beyond the carina. In spite of a free application of cocaine and epinephrine solutions, the bleeding was free, but the patient made a quick and uninterrupted recovery. Probably the mustard gas caused an ulcer and its granulations gradually hypertrophied until the inspiratory and expiratory current of air-couples with the violent coughing spasms brought about the formation of a pedunculated, vascular granulomatous tumor.

And now, Mr. President and gentlemen, I have only to thank you for your kindly forbearance in listening for so long to some of the incidents and impressions gathered on my pilgrimage to the terrace from which I have looked backward.

Of all the factors that have relieved the strife, disillusions and failures on the journey, the two greatest have been, (1) the joys of friendship and encouragement given to me by my fellow travelers, as you have done this evening, and, (2) the steady realization that year by year otology, rhinology and laryngology were establishing their fair names in the science and art of medicine. Perhaps such sentiments would be more gracefully rendered by the well known lines:

> "Contend my soul, for moments and hours;
> Each is with service pregnant, each reclaimed
> Is like a kingdom conquered, where to reign."

DISCUSSION

DR. ALEXANDER RANDALL: All cases of chronic suppuration are due to cholesteatoma. If we have a matrix of cholesteatoma we are bound to have an overgrowth of endothelium. Pearl-like masses form and may be compared to those in epitheliomas. They represent a new growth. It is necessary to remove not only the dead bone but also the matrix from which new epithelial masses form. This should be strongly emphasized.

DR. JAMES A. BABBITT: I should like to know the essayist's opinion of the partial procedures recently advocated, such as the removal of the external wall of the attic alone.

DR. MATTHEW ERSNER: Dr. Coates has been an advocate of the blood clot method of closing mastoid wounds. Sometimes a small drain is placed in the

antrum. The pathologic process is checked with the cytology. If the polymorphonuclear count is rising and the total count is falling, either complete closure or the blood clot method is used. One may even close the mastoid wound with a perisinus abscess present, should the polymorphonuclears rise and the total count drop. The osteogenic substances present eventually help in judging the best method of closure. In suppurative otitis media one must politzerize and massage as soon as possible to prevent adhesions.

Hypertrophic tissues may be present in the antrum without suppuration or nasal symptoms. Here iodized oil is a great aid in diagnosis. I am wondering whether salicylic acid in alcohol would be of value in mycelial infections of the antrum.

Why is not osteomyelitis observed more often in surgical procedures on the mastoid; one curets there?

Dr. George M. Coates: We cannot say definitely that ossiculectomy or the various types of mastoid operation are the proper form of treatment until the specific case is analyzed. Suppuration may be maintained by the necrosis of ossicles or by adhesions forming pus pockets. In such instances ossiculectomy is of value but the patients must be carefully selected. When the suppuration is not too deep-seated, drainage may be obtained by taking away the external wall of the attic or the aditus as well. A more radical operation may be done later if these measures fail.

Whether a blood clot dressing or a modified blood clot dressing is used is a matter of diagnosis. If the condition in the middle ear has cleared up before operation, a deep closure will give a healed wound in the shortest possible time without danger to the patient. If trouble arises, the wound may be reopened.

In hyperplastic maxillary sinusitis with indefinite symptoms, iodized oil gives a fine outline and differentiates dentigerous cysts from hyperplastic mucous membrane.

Dr. Fielding O. Lewis: Douglas Harmer has treated patients with cases of carcinoma of the larynx by radium alone. It has been a failure in this country. Some success has been attained in extrinsic cancer by the combined treatment.

Dr. Samuel Skillern: If the negative washings from a hyperplastic maxillary sinus are poured into a tumbler, especially in a cold temperature, an albuminous, reddish material settles out on the bottom. The hyperplastic antrum gives a different feel to the puncturing needle. There is also a "hang" to the needle if one moves it around inside the antrum.

Dr. George Marshall: Politzer controlled the hemorrhage of aural polyps by snaring and applying ferric chloride, U. S. P. This absorbs atmospheric moisture rapidly and acts as a superficial cautery. In the case of the septic tonsil, if one goes into deeper tissue and ligates, there is a possibility of further infection.

Mr. Herbert Tilley: I am undecided about the different methods. Ossiculectomy is often followed by drying up of secretions, but one must consider hearing. The patient should be informed of the future. The treatment should depend on the condition of the other ear, and each case must be considered on its merits. In the majority of cases, I would do a postaural operation.

When iodized oil shows hyperplastic changes, I treat the simpler cases by injecting mild silver protein.

Osteomyelitis does occur in the temporal bone, and I had to turn a flap downward on several occasions. It is, of course, rare. The variation in the blood supply is the main reason for the rarity of temporal osteomyelitis.

I have seen some of Harmer's patients, and the larynx in each one appeared quite normal after treatment. I think this method will revolutionize laryngeal surgery when the cases are seen early. In three or four months it is necessary to look at a diagram to tell where the lesion was.

Dr. Marshall mentioned ferric chloride, U. S. P. I will try it in tonsillar hemorrhage, but I always feel safer when I ligate.

Nov. 20, 1929

H. P. SCHENCK, M.D., *Reporter*

GEORGE M. COATES, M.D., *Chairman*

TIC DOULOUREUX, NASAL IN ORIGIN. DR. GEORGE MORLEY MARSHALL.

Dr. Marshall reported the case of a woman, aged 62, giving the history of intermittent pain, starting in the upper lip, near the left naris, going across the left side of the face to the temple, thence to the forehead and back of the eye. Occasionally, the greatest pain was near the lip and nose. The attacks had occurred for four years. Pain would continue for about three minutes and then disappear for from fifteen minutes to an hour or more. This condition would last for weeks at a time. The pain could be started by placing the finger on the lip at the left naris or could be stopped, temporarily, by pressure on the side of the nose at the point where the left nasal bone and the left nasal process of the superior maxilla join. The former probably increased turgidity and pressure, while the latter cut off the arterial blood, reducing turgidity and pressure.

The left turbinates were found to be crowded, the lower being large and hard and impinging on the floor, even when retracted by cocaine and epinephrine, so that a fine Harrison-Allen applicator could not pass beneath. The right nasal passage was freer, but the middle turbinate was hypertrophied and the septum deviated to the right.

A partial left lower turbinectomy, a submucous resection of the posterior portion of the septum and a partial right middle turbinectomy were performed. The pain completely disappeared after the dressings were removed. After complete relief for seven months, a slight recurrence of pain was noted when the patient became unusually fatigued. Rest will probably control this factor.

DISCUSSION

DR. KARL M. HOUSER: When I was on Dr. Frazier's service at the University Hospital ten years ago, I saw a number of patients who were sent in for avulsion of the sensory root of the fifth nerve. Most of them had had all of their teeth removed and in addition had had considerable intranasal surgery. Some of them received temporary relief after nasal surgery, but they had come to the hospital because of recurrence of their symptoms. Others, no doubt, had secured relief from such procedures and therefore did not reach a neurosurgical clinic.

DR. GEORGE M. COATES: Fatigue seems to have been a definite cause of recurrence in this case. What does Dr. Marshall consider the difference between major and minor tic douloureux?

DR. GEORGE FETTEROLF: Was there evidence of maxillary sinus disease in this case?

DR. EDWARD H. CAMPBELL: Does Dr. Marshall believe that the removal of a turbinate will relieve a vacuum type of headache?

DR. MARSHALL: The lowering of tolerance gives a minimal stimulus leverage. This patient improved and gained weight due to improvement in the nasal condition, plus rest. The pressure in the nose no longer exists and a vicious cycle is broken. A major case is one in which the ganglion itself is involved, whereas, a minor one is due to involvement of a branch of the ganglion alone. In this instance, there was pressure at the trigger-zone and also pressure in the vicinity of the ganglion due to turgescence. Removal of the turbinate influenced both types of pressure. It would have been proper to wash out this antrum, but there was no indication of involvement of the maxillary sinus. The factor of pressure was the impressive thing in this patient, and its removal was the procedure indicated.

OCCURRENCE OF EOSINOPHILS IN THE MUCOUS MEMBRANE OF THE MAXILLARY SINUS IN ASTHMATIC PATIENTS. DR. GEORGE M. COATES and DR. MATTHEW S. ERSNER.

This article appeared in full in the February issue (**11**:158, 1930).

DISCUSSION

DR. PHILLIP S. STOUT: The technician at the Jefferson Hospital asthma clinic has reported this condition for some years. We have performed a large number of Caldwell-Luc operations on patients with asthma, but have found that although they were relieved, the symptoms eventually returned if we waited long enough. There is a distinct relationship between eosinophilia and asthma as the person without asthma and the patient with asthma may both show eosinophilia. Sinus disease never produces asthma in a person not allergic.

DR. J. ALEXANDER CLARK: A number of peculiar things occur in patients with asthma, none of which are constant. Hypotension may be mentioned as one of these phenomena as well as eosinophilia. It is a question whether eosinophilia has anything to do with asthma or whether it is just an accident. In a large number of cases which we studied, only one third of the patients showed eosinophilia in the blood, while the others did not show it at all. In hay-fever, there is no eosinophilia in the blood. Occasionally from 50 to 60 per cent of the leukocytes in the sputum may be eosinophilic. The Germans differentiate between true eosinophils and pseudo-eosinophils, regarding only as true eosinophils those with large granules.

DR. KARL M. HOUSER: What was the relationship of the eosinophils in the mucous membrane to the blood eosinophilia?

DR. GEORGE M. COATES: There has been much dispute about the nasal factors in asthma. Is hyperplasia the result of allergy or the cause of the allergic manifestations? That the nose has a specific influence in sensitized persons may be shown by removing a polyp or some hyperplastic mucous membrane. The word "cure" is always a relative one, but many patients undoubtedly were relieved by minor intranasal procedures.

Tobey, Emerson and Mosher have also found the eosinophils in their cases. Our patients with asthma were relieved when the mucous membrane was removed. What this means is difficult to say, but it is an interesting observation. The occurrence of eosinophilia is so uniform in asthmatic sinus disease that it deserves some thought. Emerson believes that in all cases of vasomotor rhinitis, there is disease of the maxillary sinus, and that an atrophic mucous membrane is just as important as a hyperplastic lining.

DR. ERSNER: Recurrence is probably due to regeneration of mucous membrane or to damming up of secretions. A peculiar slimy fluid is present in allergic persons. Predisposition to asthma is a debatable subject. The eosinophils were identified by Dr. Kolmer. We did not check the blood picture in our group of cases nor perform intradermal tests with the isolated organisms.

LYMPHO-EPITHELIOMA OF THE TONSIL: A BILATERAL CASE. DR. PAUL O. SNOKE.

Dr. Snoke reported the case of a white woman, aged 60, who was well until December, 1925, when she noticed a sense of constriction and discomfort in her throat. Simultaneously, a mass appeared in the left side of the neck at the angle of the jaw, which enlarged to the size of an egg in one month. There was no history of acute intra-oral infection. Results of a physical examination were otherwise negative at the time.

The left tonsil was greatly enlarged, red and hard and the surrounding structures were indurated. The tonsil crypts were dilated and clearly visible. The right tonsil appeared normal. In the left side of the neck there was a mass of glands over the carotid bulb. The Wassermann test of the blood was negative.

Following the introduction of radium needles directly into the tonsil in January, 1926, the patient remained well until January, 1928, when she developed severe headache and diplopia. There was a mass above and mesial to the inner canthus of the left eye, involving the frontal bone and the frontal and ethmoidal sinuses. This mass displaced the left eye laterally. Several days later dysphagia developed. There was no dysphagia or hoarseness.

Laryngoscopy revealed a mass in the right pharyngeal wall at the pharyngoesophageal junction which was submucosal. There were no palpable cervical glands. The chest was negative for metastasis as shown by the roentgenograms.

Ten days after radiation of the left frontal area and the left and right cervical areas, the frontal mass had disappeared and the dysphagia was greatly relieved. A month later the patient complained of great dryness of the mouth and partial deafness in the left ear. Results of an examination revealed a mass in the left nasopharynx occluding the eustachian tube and another tumefaction in the left soft palate. Both of these masses resembled the orbital mass. Digital examination of the pharynx and the posterior third of the tongue was confirmatory except that the right tonsil was found to be stony hard, normal in size and well circumscribed. It did not have the visual appearance of a neoplasm, nor was there any ulceration, but the hardness aroused the suspicion of the examiners and a biopsy was taken. Dr. Ewing agreed with the diagnosis of lymphoepithelioma saying, "It is difficult to distinguish many of these cases from lymphosarcoma. The clinical history helps and here the absence of nodes in the neck after two years tells against lymphosarcoma." This biopsy was taken from a normally appearing right tonsil, the left tonsil having been destroyed by radium in 1926.

The recurrence failed to respond, and the patient died in June, 1928. The significant points in the clinical course of this patient were: the duration of the disease for two and one half years, the location in the tonsil, the sensitive radiation response and sensitive metastatic response, the dicuse recurrence (not glandular) and the involvement of the opposite tonsil. The value of palpation of both tonsils in dealing with intra-oral neoplasia was stressed. The numerous areas of lymphoidal tissue in the nasopharynx afford easy access to neoplastic cells and metastatic growth, visualization of which means relatively little without palpation.

DISCUSSION

DR. BERNARD P. WIDMANN: This is an intra-oral type of cancer so sensitive to radiation that it has been called lympho-epithelioma to differentiate it. Cancer of the alveolar process also responds well to irradiation and differs from the usual cancers of the squamous cell which are resistant to irradiation. Cancers of the mouth, and especially of the tonsil, are less accessible and therefore are more extensive before they are seen. The pharynx, tongue and peritonsillar tissue is involved by this time, and we have to rely on irradiation alone. The early case is rarely observed. The Mayo Clinic classifies these tumors as lymphosarcomas because of the diffusing infiltration which occurs. The peculiar sensitivity of this type of cancer resulted in reclassifying it. Varying classifications are given by pathologists, but the more highly cellular a cancer is, the more sensitive to radiation and the more malignant.

Electro-coagulation causes slough, suppuration and pain so that seeds plus heavy external radiation to the physical limit of the patient and toleration of the skin, have been employed. If there is involvement of the gland, then the chance of cure is slight.

Surgeons until recently thought they could do a block dissection when involvement of the gland occurred in oral cancer. If the involvement was bilateral, this was hopeless. Block dissection in the unilateral cases has given good results. We now feel that if there is surgical metastasis, the case is inoperable. Many cases on record as cured cancer of the tonsils probably belong to this group. In this case, metastasis probably occurred before treatment was instituted.

DR. FIELDING O. LEWIS: This patient died of starvation. Were patients with esophageal involvement treated in a similar manner as those with other lesions? One patient treated at the Philadelphia General Hospital had tonsilar involvement but no peritonsillar extension. There was a palpable gland in the neck. He is still living six years after treatment. In many cases of cancer of the tonsil the patients have done well following radiation, even when the tongue, soft palate and pharynx were involved. In one patient, the alveolus, part of the tongue and the soft palate were treated first with desiccation and later with radiation, with splendid results.

DR. JAMES A. BABBITT: A patient with lymphosarcoma of the tonsil at the Lankenau Hospital received external cross-fire radiation. With the disappearance here, a swelling appeared in the superior carotid triangle of the neck. This was also treated with radiation. Later, a careful dissection was made by Dr. Deaver, but in a few days general metastasis, especially to the mediastinum, occurred, and the patient died.

DR. SNOKE: The pathologist is playing a large rôle in determining the degree of treatment. We need standardization of pathologic classification. Some of these patients get well. Those who die do so in a two year interval. In this case radiation was applied over the esophageal region. We now regard it as unwise to interfere after a hard, fibrous mass appears following radiation. We always persuade the patient not to have further interference as this leads to metastasis and a vicious recurrence.

CHICAGO LARYNGOLOGICAL AND OTOLOGICAL SOCIETY

Regular Meeting, Nov. 4, 1929

THOMAS C. GALLOWAY, M.D., *Vice-President, Presiding*

HEMANGIECTATIC TUMOR OF THE TYMPANUM. DR. FRANCIS LEDERER.

Mrs. F. A. Z., aged 53, was first seen on Aug. 23, 1929, complaining of a pulsation in the right side of the head, pain in the neck and head of about two years' duration and impaired hearing of three years' duration. Her symptoms had become progressively worse, and included a sort of quivering, jerky sensation in the face. She said that several physicians had opened what they termed a "blood blister," and each time a severe and almost uncontrollable hemorrhage followed. Her general and family history revealed nothing of importance, and the laboratory and physical observations were negative. She had never had a discharging ear.

Examination of the right ear showed a large, purplish, granulomatous-appearing mass in the canal on the posterior inferior wall, anterior to the tympanic membrane. This mass was quite firm and did not pulsate. There was, however, visible vascular pulsation in the region of the attic. On auscultation with a diagnostic tube, one end in the patient's ear and the other in the examiner's ear, a definite bruit that corresponded to the patient's pulse as well as to the rhythm of her subjective pulsation could be heard. The tuning fork tests indicated only a marked involvement of the middle ear; the whispered voice was heard at contact.

Roentgenologic examination revealed a "possible rarefied area in the right mastoid."

Examination of the eye by Dr. Emil Deutsch showed a marked blepharospasm of the oscillating type involving the upper lid, not the eyebrow. The spasm was more marked on the lower lid, extending to practically the entire right lower two thirds of the face, the upper and lower lids being drawn outward during the spasm. The patient said that these spasms were periodic, lasting from five to twenty minutes and perhaps not recurring for hours. The right palpebral fissure

was wider than the left, being 8 mm., and the right 15 mm. There seemed to be a slight proptosis of the right eye. Measured with Hertel's exophthalmometer, the right eye was 14, the left 13. The extrinsic muscles were normal. Observations on the media and other observations were negative.

Examination of the fundus showed no pathologic changes. Vision with the correction was 20/20.

A tentative diagnosis of angioma of the tympanic membrane was made, and Dr. Joseph C. Beck was called in consultation. He concurred in the diagnosis and advised an exploratory operation. On Sept. 7, 1928, with the patient under general anesthesia, Dr. Lederer carried out the technic of a radical mastoid operation until he reached the posterior bony canal wall, where considerable bleeding from the mass in the canal was encountered. The mastoid cells were normal but the fluid contained in each was seen to pulsate. As the posterior canal wall was taken down at the bridge a soft mass was encountered in the middle ear, which bled so profusely that the cavity was immediately packed. The dura of the middle fossa was exposed in order to ascertain the origin of the mass, and there also profuse pulsatory bleeding was encountered. In order to eliminate packing, a plastic operation on the canal was done according to his usual technic.

The histologic appearance of the tissue removed was that of a cavernous angioma. It was impossible to remove extensive portions because of the uncontrollable bleeding, but Dr. Lederer believed that he was dealing with a hematoma. According to the history, this was not a new formation and fitted in with a congenital malformation similar to a vascular nevus.

On the fifth postoperative day, the patient developed a facial palsy on the side on which operation was performed. Any attempt to remove the pack caused profuse bleeding, and not until the tenth postoperative day was it possible to substitute a smaller pack. The facial palsy gradually cleared up and the patient left the hospital, but was observed at frequent intervals. She was relieved from the marked pulsation, but the tendency to bleed persisted to such an extent that epidermization was permitted to occur just inside the meatus of the external canal, in order to protect the tumor mass.

At the time of the report, the twitching of the face persisted and the pulsatory bruit could still be elicited with the diagnostic tube.

DISCUSSION

Dr. Otto Stein: I saw this patient before, and was impressed by the dramatic aspect that a case of this type presents from the diagnostic standpoint. The appearance of an ear of this kind is often that of a blue drum membrane, and is mistaken for fluid within the middle ear. If one is not careful in the diagnosis one may incise a mass of this kind and meet with alarming and possibly uncontrollable hemorrhage. A blue drum membrane is often difficult to diagnose. It is sometimes due to fluid in the cavity and sometimes to bulging of the jugular vein. The type of case presented by Dr. Lederer did not offer this difficulty, but one should be careful not to attempt incision.

Dr. Robert H. Good: I was reminded of a patient who was under my care several years ago. The case was one of mastoid infection, with necrosis in the region of the antrum and of the tegmen. I used packing because of the severe hemorrhage, and about fifteen hours later the nurse reported that the patient was paralyzed in one leg and arm. The blood had gone extradurally into the temporal region. With the patient under anesthesia I quickly did a decompression operation, which relieved the paralysis, but the patient died from uncontrollable hemorrhage. I do not know whether the case was one of angioma or not, but there was necrosis of all the bony tissue in the tegmen.

Dr. Francis Lederer: I attempted coagulation by surgical diathermy but every time the bleeding was stronger. This patient also has suffered from several spontaneous hemorrhages.

The question was one of etiology. Whether it occurred from gravity or whether it was a telangiectasis I do not know, but the condition was annoying

for both the patient and the physician. The one thing that operation did in this instance was to insure the patient against spontaneous hemorrhage because there was then a web of epidermis across the canal, which protected the bluish hematoma which could still be seen.

How Physician and Social Worker Unite to Solve the Modern Hearing Problem. Dr. Wendell C. Phillips.

Dr. Phillips spoke of the origin of the efforts at rehabilitation which began before the World War, and called attention to two categories of the disabled because of deafness, one in which the defect was stationary, and the other in which it was progressive. He mentioned thirty-six states in which vocational training is provided for these people through bureaus. The otologist finds a mechanism for the rehabilitation of the deafened in the American Federation of Organizations for the Hard of Hearing, which embraces seventy organized groups in the United States and Canada. These organizations are developing a personnel, almost all of whom are deafened, of social workers for this special work. None of the organizations includes work for the congenitally deaf, but they are in cordial agreement with the objectives of such societies as the American Federation to promote the teaching of speech to the deaf.

He pointed out that the federation had adopted a program of public education and information, aiming to check the development of progressive deafness; it is also promoting and undertaking surveys of schools to discover incipient cases of hearing impairment. Twelve per cent of the elementary school children were found to have some defect in hearing. Dr. Phillips said that he looks with confidence to the future in this program to check the development of serious deafness.

Mutual Relationship Between the Otologist and the League for the Hard of Hearing. Dr. Harold Hays.

Dr. Hays said that for fourteen years he had been vitally interested in the social and economic handicap under which the deafened person lives. In 1912, working at the New York Eye and Ear Infirmary, he tried to inquire as to what the deafened persons did and what happiness they derived from life.

The New York League for the Hard of Hearing was formed, with the alumnae association of Mr. Edward Nitchie's school as the base. The league gradually gained in momentum and after the World War they were able to engage the enthusiasm of Dr. Phillips; in 1921, the American Federation of Organizations for the Hard of Hearing was started. There was some suspicion at first as to what this organization was to do, but during that year Dr. Phillips and Dr. Hays formulated a constitution and by-laws, enlisted the cooperation of the American Medical Association and secured the assistance of a number of otologists. The league could never succeed in any community without the cooperation of the otologists in that community.

There are two things to consider: first, how much assistance the otologists can give to the league, and second, how much the league can give to them. Otologists receive far more benefit from the league than they ever can give to it, when they find out what is being done and how they can cooperate. In New York City the otologists find many hundreds of patients for whom they can do nothing. Not 1 case out of 1,000 is otosclerosis. If a patient has an advanced degree of deafness and an examination shows that little can be done, the patient should be informed that his deafness is of such nature that little can be done medically, but that if he places himself in the hands of a competent otologist he can perhaps keep him from becoming worse. Such patients should be told to have their ears tested twice a year, and should be assured that they can add greatly to their happiness if they will help themselves, and will acquire mental readjustment so that they will realize that life is worth living. In New York such patients are sent to the League for the Hard of Hearing to become reestab-

lished mentally and to ask them to try various hearing devices which the league has on exhibition to find out which is the best for the individual case. They are requested to find out what lip reading will do for them. They are also made to realize that there are many hundreds of little children who need help and this cannot be obtained unless they lend their cooperation.

Dr. Hays felt that every otologist in the United States should be told of the wonderful work that the American Federation of Organizations for the Hard of Hearing was doing, and that they should be urged to cooperate with such an organization in their own town. It has been difficult to make otologists realize that this work is worth while for themselves as well as for their patients. Three years ago the American Medical Association appointed a committee with two men from each state as members to study this question, mainly the prevention of deafness. No concerted effort has been made to accomplish any particular thing but these men have been deluged with literature from the federation, and Dr. Hays felt that eventually a proper interest will be awakened.

The work of the league was concerned largely with the adult hard of hearing, but this has turned, to a great extent, to the prevention of deafness in children, for 8 or 9 per cent of the children attending public schools are sufficiently deafened to need thorough examinations. Dr. Fowler has a splendid clinic in New York City. There children are investigated thoroughly from all standpoints, and infections are cleared up. Dr. Fowler has not been able to get the cooperation of the physicians in New York City, and Dr. Hays realized that it is a problem they should help solve.

The phono-audiometer can be used in the public schools, so that forty children can be examined at one time and those who need more careful tests can be weeded out. In Detroit, there is a school for the deafened, and an eminent otologist there has cooperated with the school since its earliest existence. Not only hearing but also mental tests are made. The intelligence test will often show a mental co-efficient above normal, and if the hearing of a child is improved by attending a special school and learning lip reading it frequently happens that they can be returned to their normal school at the end of the year. Dozens of children are brought to the clinic in New York City, many of whom need instruction in lip reading while others need medical treatment. Excellent results can be obtained by careful observation and treatment. Dr. Fowler has treated more than 200 children in three years. The children are divided into two classes, those with suppurating ear and those with catarrhal deafness. More than 60 per cent of the patients have been improved. The league has a large board of consulting otologists, and if the patient cannot afford to pay, any one of these physicians will make an examination and report to the league.

Dr. Hays felt that this problem must be met in a personal way, and that every member of otologic societies everywhere should be willing to cooperate with the American Federation and local league. The committee on the hard of hearing of the American Academy of Ophthalmology and Oto-Laryngology recently met to determine how to arrange for one central committee of the various national societies. They felt that if the otologists of the country would work along certain definite lines the coordination of effort would accomplish a great deal.

A standardized method of testing hearing is essential. This can be done only by having a standardized instrument which all otologists will use. Such instruments are obtainable, and the interchange of accurate records will be of great value.

Those who have been working along this line for several years believe that the time is coming when it will be possible to improve the condition of the deafened adult and the deafened child, and that some cases can be prevented by proper attention and some patients even cured. Much has been accomplished in the realm of physics mainly by the cooperation of the Bell Telephone laboratories in interpreting types of deafness and perfecting apparatus. But, up to the present, the medical profession has done little. Dr. Hays sincerely hoped that the otologists will soon realize that preventing deafness is equally as important an accomplishment as operating on a patient with a virulent mastoid infection.

DISCUSSION

DR. GEORGE E. SHAMBAUGH: I believe that most human happiness can be credited to humanitarian ideas, which are shared by most people, but very few have the ability to formulate plans to put these ideas into execution. Otologists have always desired to do all they can for the deafened, but the first consistent effort to work out a helpful scheme for rehabilitation was accomplished by Dr. Phillips in formulating the League for the Hard of Hearing. The league is of great assistance to every otologist, who is now able to tell the patient afflicted with incurable deafness not that they have an affliction for which nothing can be done, but rather that through the League the door is opened to them for rehabilitation. The otologist has his own problems which do not include the social work of rehabilitation, teaching lip reading, as well as the economic and social problems for these people. I would be at a loss in practicing otology without the assistance that comes from the league. I agree with Dr. Hays that most of the children who have defective hearing can be benefited, and that many of them can be cured by treatment. The reason is that most of these children owe their defective hearing to tubotympanic trouble, a condition that can be readily relieved. An important question is, in how far do these conditions in childhood predispose to the development in adult life of the condition that is known as progressive deafness, or otosclerosis? I am of the opinion that progressive deafness of adults is not the sequel of the tubotympanic processes so common in childhood. Otosclerosis rarely begins during the first decade. The number of persons suffering from deafness, as the result of otosclerosis, is considerable. I am convinced that it is not the rare condition which early otologists believed it was, and this view of the incidence of otosclerosis is today shared by those who have been most interested in this problem. I think that Dr. Hays touched on an important question when he discussed the manner in which the matter should be presented to patients. Great tact is necessary. The facts can be told in such a way that they do not greatly shock the patient. It is rather the exceptional case of otosclerosis which proceeds to the point of severe, or total, deafness. Bezold pointed out long ago that many of these cases go for long periods apparently without any change. These facts should be pointed out to patients who are inclined to be depressed. They should also be told that the progress of the deafness is much more likely to be influenced by conditions of general health than by anything that is done locally to the nose, throat or ears. These people should also be warned that in all of our large centers are men, graduates of medical schools, who are willing to prey on the helplessness of these persons, and encourage them to allow them to carry out foolish and bizarre methods of treatment, which they should know cannot possibly influence the process that is causing their trouble.

DR. OTTO STEIN: I believe that the subject is not discussed sufficiently in medical societies in general. I have found that otologists suffer from a marked degree of apathy so far as the hopeless side of deafness is concerned, and seem to be indifferent toward making any effort to assist these patients. I have taken a great interest in the League for the Hard of Hearing, and think that without their assistance I would often leave my patients stranded. They are greatly benefited when they become acquainted with and join the league.

Not long ago, in discussing this subject at a dinner, one of the prominent men in the city said that he thought there was a tendency on the part of the league to interfere with the practice of medicine, that it rather smacked of state medicine and he was against it. I fear that this feeling exists with others because they are not aware of the real situation, and do not trouble themselves to find out what splendid assistance the league gives.

DR. JOHN J. THEOBALD: I have been engaged in detecting the hard of hearing rather than in the reeducation. I have examined with the whispered test about 30,000 school children under the auspices of the Chicago league and have found about 3 per cent to have definite hearing defects. Considering that there are about 500,000 school children in Chicago and that it has taken six or seven years to examine 30,000, it is apparent that much remains to be done. The examina-

tions, while slow, were rapid enough to keep pace with the follow-up work. We did not have the advantage of an audiometer until the last school was examined recently. At this school we used the 4 A audiometer, and also the whisper test method. Comparative results will be published soon. Audiometer reports vary from 2 to 16 per cent. This variation is too great and there is urgent need for standardization. One has to be careful to avoid such high percentages by rechecking, for when children not clinically hard of hearing are sent to clinics or to their physicians they are often returned with a negative diagnosis and this discredits the work, for parents want to hear that their child is normal. With the whisper test and tuning forks about 52 per cent of the patients were found to have tubotympanic catarrh and were greatly benefited by inflation. Patients with advanced cases of catarrh who could not be benefited by inflation were advised to learn lip reading. I think that it would be excellent if children could take part-time instruction in lip reading as an adjunct to their other school work, when the present defect is not sufficient to warrant full-time instruction. Instruction in lip reading should be urged in all cases in which one decides that there is a progressive form of deafness.

Besides chronic catarrhal cases, this group includes bilateral chronic suppurative otitis media, otosclerosis and some cases of nerve degeneration. One must not be misled by the apparently fair hearing ability in a child suffering from the progressive conditions mentioned. One must think rather of the almost inevitable loss of hearing over the ensuing period of from ten to twenty years despite all forms of treatment.

The League has not been able in the past to arouse much enthusiasm in Chicago in regard to the introduction of routine examination in the schools, although since the advent of the 4 A audiometer there are definite signs of activity. I have recently been informed that the Chicago school system contemplated getting three of these instruments and going into the examinations on a large scale. This was gratifying news to the Chicago League for the Hard of Hearing and to the medical profession in general as it is the beginning of the solution of an old problem.

The medical profession is indebted to Dr. Phillips and Dr. Hays who have been directly responsible for the formation of the leagues for the hard of hearing, who in turn have provided the stimulus for routine examination of school children.

Dr. J. Holinger: Splendid work is being done by the League for the Hard of Hearing in Chicago, and I commend the great responsibility of the physician who handles these patients. Many of the patients become desperate and attempt suicide when they are informed that they have progressive deafness and that nothing can be done. It is not the otologist alone who should be informed about this work, but the general practitioner who sees the patients in the early stages of deafness, and often does nothing for them beyond advising the use of "sprays" for the nose. If they get a better understanding of these cases and realize the seriousness of delaying proper diagnosis and advice, much more can be accomplished for the patients. Most of the physicians do not realize that they are neglecting these patients cruelly.

I believe that Dr. Hays must be mistaken when he says that not in 1 of every 1,000 cases in which the diagnosis of otosclerosis was made by otologists was this diagnosis correct and could it be verified by pathology. I insist that the opposite is true, namely, in every case in which the diagnosis of otosclerosis was made in the living according to the teachings put down by Bezold and Siebenmann. The characteristic changes were found in the dead. Before Siebenmann cleared up the situation, it was believed that a large part of the disease was due to changes in the blood vessels, because of the loud thumping noise synchronous with the pulse. Therefore, Siebenmann worked out his beautiful atlas of the blood vessels of the labyrinth.

Dr. Alfred Lewy: Is there an electric device in this country that is especially fitted for deafness of the inner ear? I believe that most of the amplifiers as now made are unsuitable for this condition. Professor Flatau presented an instrument

before the German Otolaryngological Society that is alleged to damp lower tones, to amplify higher ones and to be of aid in deafness of the inner ear.

DR. G. HENRY MUNDT: I think that the question of sending these patients to physicians was interesting and brought up a point which might well be considered. There is a strong tendency among many physicians to agree with parents that there is nothing wrong with a child. I believe that it might be possible to prepare a statement that could be printed on the back of the examination blank stating that the child had shown a certain percentage of deafness. The same thing applies to deafness as to strabismus in young children, but it is difficult to make people understand that these conditions should be treated during early childhood. I have had an unusual opportunity for observing these children, for I lived next door to a school for the deaf for several years. I believe that only a person who has seen these children develop can really understand what they get and what they can get out of life. No otologist can follow his deafened patients unless he makes audiograms frequently.

I consider the League for the Hard of Hearing the type of organization that the medical profession would be pleased to work with, and suggest that some effort be made by the Society to broadcast to the general practitioners something of the scope of the work, and the opportunity really to serve these patients. Several times a year I see young children who are undoubtedly deaf, and those are the cases on which I spend the most time. I talk to the parents and make them understand that the child should be placed at once where its education can be started, instead of waiting until it is grown or half grown, as so many practitioners advise.

DR. AUSTIN A. HAYDEN: I express my appreciation of the presentation of this subject and my interest in the discussion. I hope that the habit of willing temporal bones to physicians will increase, particularly if the bones are accompanied with a detailed history of the case from its inception. Not until a number of such cases have been obtained can a comprehensive study be made and recorded.

I believe that the discussion of the papers could be summed up in two things: 1. Otologists should cooperate with the League for the Hard of Hearing. If the problem of the deaf and the deafened is to be solved by the proper people, the medical profession must contribute a large share of the effort, and must guide the work and interests of these persons into proper channels or great harm will be done to the deafened today, and a great opportunity will be taken away from those who are to come. The society owes a great debt of gratitude to its council of last year in the fact that the council adopted a resolution by which every member of the society was automatically made a member of the Chicago League for the Hard of Hearing. I believe that this plan should be put in force all over the country, so that each otologist would become an integral part of the leagues for the hard of hearing.

2. I believe that otologists must come to standardize the measurement of hearing defects. One will agree that much of the work Dr. Theobald has done, much of the excellent work Dr. Shambaugh pioneered in and the work Dr. Hagens had assisted with in the institutions would have been more valuable if the tests had been made with the 4 A audiometer than with the whispered test. The same thing is true of the otologist in the office. They should use not only the 2 A but also the 4 A audiometer, and should standardize the whisper test.

There is a great deal to be done for the deafened by the medical profession, and in return perhaps some things that they can do for the physician. Every otologist should be vitally interested in the problem that affects such a large percentage (perhaps 10 per cent) of the population.

DR. A. M. CORWIN: I was impressed with the fact that every otologist should broadcast to his own conscience the fact that in the League for the Hard of Hearing there is a body of specialists who are doing work that the medical profession never has done and never will do for they do not know how to do it. It is a most important thing for these handicapped persons, and it is the duty of every physician to refer the deafened to the laboratories of the League for the

Hard of Hearing. The sooner they realize that there are laboratories with which they can cooperate and that they are doing excellent work the better will be the progress.

DR WENDELL C. PHILLIPS: Before making any attempt to educate the general practitioner as to what his duty is, the otologists of the country should be educated. Few of them have any idea of what is needed, and I believe that the Chicago society could consider itself far in advance of the general run of otologists.

It is necessary to solve the problem of deafness, whatever type it may be. I am in accord with the work of the American Otological Society and that of the other societies that study temporal bones, and am in full sympathy with the work among the deafened children. Some time the problem will be solved; it may be in the laboratory through the study of temporal bones, or it may be through the study of the diseases beginning with the young children. I am more inclined to think through the latter.

As to electric hearing aids, there are certain deafened persons who can never hear with an electric device. Very old persons who are almost totally deaf rarely can hear through such a device. I have seen few cases of absolute deafness, but recall one hopeless case in which the patient was totally unable to hear any sound.

DR. HAROLD HAYS: I appreciate Dr. Shambaugh's remark and his sympathy with the work the leagues are doing.

I agree that although many cases have proved to be otosclerosis by laboratory investigation, many persons are down and out because this diagnosis has been given them when it was later proved that the deafness was due to something entirely different. The greatest bugbear today is this diagnosis. Patients are afraid of the term otosclerosis and they do not believe, as Dr. Shambaugh does, that such a condition can be improved. I do not claim to know any more about otology than anyone else, but I believe that many cases have been diagnosed as otosclerosis which showed a deafness due to a relaxation of the ear drums or to some systemic toxic factor.

MENINGITIS (STAPHYLOCOCCUS AUREUS) SECONDARY TO SINUSITIS WITH OPERATION AND RECOVERY. DR. HOWARD C. BALLENGER.

A number of recoveries from meningitis have been reported in the literature, but when the diagnosis of a suppurative meningitis has been substantiated by the recovery of the causative organism in two or more lumbar punctures, the number of reputed recoveries is greatly lessened.

Kolmer, in writing of pneumococcic and streptococcic meningitis, said that "the mortality of diffuse spreading types with purulent cerebrospinal fluid is nearly 100 per cent."

Neal, in 1914, found only five cases of recovery following streptococcus meningitis. Lamar, in 1912, collected reports of thirteen cases of pneumococcus meningitis in which cure resulted. Eagleton, in 1912, in an analysis of the literature of reported recoveries from suppurative meningitis in which the diagnosis was substantiated by finding organisms in the cerebrospinal fluid, found only thirty-one cases (including his own). Six of the thirty-one cases were somewhat doubtful of being meningococcus or were without sufficient data to prove clearly that they were suppurative meningitis.

Goldstein and Goldstein, in 1927, after a review of the literature, estimated about 150 cases of recovery from pneumococcus meningitis.

The reference in the literature to staphylococcus meningitis is rather meager, probably due to the comparative infrequence of its occurrence.

Neal, in 1924, examined a list of 1,535 cases of purulent meningitis. The causative organisms, in the order of frequency, were meningococcus, pneumococcus, streptococcus, influenza bacillus, staphylococcus and *Bacillus coli*. Cases due to the last two organisms were found to be comparatively rare.

There seems to be a general impression that a purulent meningitis due to a streptococcus is more virulent than one due to a staphylococcus. Perusal of the literature fails to offer evidence for, or against, this impression. Dandy attributed more importance to the virulence of the organism than to its type. Recoveries from staphylococcic meningitis have been reported by Dandy, Moise, Lortat and Grivot, Salvini, Emerson, Wharry and probably others.

Records of Children's Memorial Hospital.—An examination of the records of the Children's Memorial Hospital, for the years 1909 to August, 1929, of all cases of meningitis (exclusive of tuberculous meningitis) reveals a total of 297 cases, 273 of which were epidemic meningitis, leaving 24 cases (excluding my own) of septic meningitis. All but 1 of the 24 patients with septic meningitis died in from one to fifteen days. This patient (no. 2) was taken from the hospital without permission, in a dying condition.

The various white blood cell counts were recorded in 14 cases. They varied from 3,250 to 58,800, giving an average of approximately 22,000.

The cell counts of the spinal fluid taken by lumbar puncture were recorded in 19 cases (1 case marked "many"). They varied from 210 to 14,400 cells. An average of these counts gives a figure of about 3,800.

A culture of the spinal fluid was recorded in 23 cases. An organism was obtained in one or more cultures during life in 21 cases. In the 2 cases in which an organism was not demonstrated during life, an organism was obtained from a culture taken at autopsy. A streptococcus was responsible in 13 instances. A pneumococcus was found in 10 cases.

A culture of the blood was recorded in 5 cases. In 4 instances, a positive report was obtained. All the positive blood cultures showed the same organisms that were found in the spinal fluid.

R. L., a boy, aged 6 years, entered the Children's Memorial Hospital (Chicago) on Aug. 17, 1929, complaining of headache, fever, convulsions and swelling of the forehead and left eyelid.

The illness began two days before admission with a frontal headache and a purulent discharge from the nose, worse on the left side. His nose had been discharging mucopurulent secretion for the past month. He was said to have had sinusitis. The day before admission he began to have some swelling above the bridge of the nose and the midline of the forehead, accompanied by a high fever. In the evening he began to jerk and soon to convulse generally. These convulsions lasted about two hours until relieved by packs and chloral. No vomiting occurred.

The past history was unimportant except that one month before presentation he had an attack of diarrhea and vomiting.

The physical examination revealed a well nourished child who was irritable and febrile. The ears, chest and abdomen were normal. A diffuse, brawny, tender swelling, without redness or fluctuation, was present over the middle and lower portions of the forehead and the upper part of the nose and left upper eyelid. Rigidity of the neck was present; Brudzinski's sign was absent; the knee reflexes were not elicited; Kernig's sign was positive; Babinski's sign was not constant, and ankle clonus was not present.

The blood count showed 16,400 cells, 88 per cent polymorphonuclears and 12 per cent lymphocytes.

The spinal fluid was turbid and under moderate pressure with a 2 plus Pandy test. The cell count was 320, with 96 per cent polymorphonuclears and 4 per cent lymphocytes. Culture of the spinal fluid taken at this time showed gram-positive staphylococcic which on further growth proved to be *Staphylococcus aureus.*

The following day the patient's condition was worse with increased stiffness of the neck and increased swelling and tenderness of the forehead and upper left eyelid. He was irrational at times. Positive Brudzinski and bilateral Kernig signs were present. Ten cubic centimeters of concentrated antimeningococcus serum was given.

The following day (August 19) I saw the child in consultation with Dr. P. F. Morf and Dr. G. P. Weiler, who had referred the patient to me. As his condition

was growing worse and signs of the meningitis were increasing, it was decided that he might have a slim chance if the left frontal sinus was opened externally with removal of the inner bony table to establish drainage from the probable point of entrance of the infection to the meninges. This was done the following day. The left frontal sinus was filled with a thick yellow pus. The mucous membrane lining the sinus was detached and appeared to be partly destroyed. After the inner table of the frontal sinus was removed, the same yellow thick pus escaped from the dura with a more or less continuous flow. Culture of this pus revealed *Staphylococcu aureus.* The right frontal sinus was opened by removal of the septal wall that separated the two sinuses. Pus was also found in the right frontal sinus. Cigaret drains were stitched into the wound, one drain going to the right frontal sinus and another to the dura. The wound was not closed. Lavage of the brain was not used at operation or subsequently. The general postoperative condition was good.

Cultures taken from the frontal sinus, dura, blood and nose at various times all showed *Staphylococcus aureus.*

Three days after the operation pneumonia developed in the left lower lobe with later involvement in the right axillary region. The pneumonia was probably of a metastatic or a hypostatic type.

A day or so later a profuse discharge of pus was obtained from beneath the outer portion of the upper eyelid, probably a burrowing of pus from the left frontal sinus. The spinal fluid continued to show the staphylococcic organisms (with one exception) each time a spinal puncture was made up to and including September 11 (three weeks after the operation).

The cell count varied from 260 to 3,350. In the instance in which the cell count was 3,350, the polymorphonuclear cells were 94 per cent and the lymphocytes 6 per cent, which was about the proportion held throughout, with a slight relative increase in the lymphocytes at times.

The highest white blood cell count was 32,400 which was taken on August 25, five days after the operation.

On September 3, two fluctuating elevations, about the size of a dollar, developed over the occipital region and over the parietofrontal region, which on incision proved to be abscesses containing a large amount of thick yellow pus. A pure culture of *Staphylococcus aureus* was obtained from each abscess. A few days later a third abscess occurred in the left parietal region which also showed *Staphylococcus aureus.* Roughened bone could be felt under each abscess. The abscesses were probably due to an osteomyelitic process. One abscess is still draining with a diminishing discharge at the present date (November 1).

In the three instances in which blood cultures were taken, positive cultures of *Staphylococcus aureus* were obtained twice. The first negative blood culture was found nineteen days after the operation.

The patient was in a semicomatose state, drowsy and irrational at times during most of his illness with occasional attacks of vomiting. Headaches were complained of frequently. Many times he would waken with a loud cry (meningeal cry).

On September 11, or the twenty-first postoperative day, he suddenly developed a complete paralysis of all the muscles of the right eye with a dilated pupil which did not react to light. He could count fingers in this eye and later could read large type. There was some question whether or not a slight choking of the disk was present. The paralysis of the pupil and the muscles of the right eye had continued to the time of presentation with some improvement. All evidence of sepsis, however, had disappeared. He had no other evidence of a mental or physical defect with the exception of a slight discharge from one of the abscesses on the scalp (November 1). In summing up, this patient presented the picture of a double frontal sinusitis with suppurative meningitis (*Staphylococcus aureus)* complicated by bronchopneumonia and multiple abscesses of the scalp, probably of osteomyelitic origin, with septicemia, drainage of the brain through the probable site of the infection and recovery.

DISCUSSION

DR. J. HOLINGER: Is there any experience which might give information as to whether in the early use of the serum in epidemic cerebrospinal meningitis there might be fewer cases of subsequent total deafness? This question was prompted by an experience in the Alexian Brothers Hospital a number of years ago. Four boys of the same family were brought in with cerebrospinal meningitis. They received the serum as soon as possible. One boy died and the other three were discharged with beginning deafness. One physician told the mother that the boys would be all right, but I told her that I thought that all three would be deaf, and so it happened. I want to know whether it is the general experience that deafness does not occur if the serum is used early, and how early it must be used.

DR. T. C. GALLOWAY: I am interested in this report and appreciate the courage of Dr. Ballenger. It should make the medical profession appreciate the possibility of curing such a patient, no matter how hopeless the case might appear. I recall three cases that were reported from the Cook County Hospital several years ago of progressive meningitis in which the physicians would have been justified in doing nothing, but in all three cases recovery was obtained.

DR. HARRY L. POLLOCK: A somewhat similar case occurred in which the patient recovered without operation. The patient was a boy, aged 12, on whom an ethmoid operation had been done during an acute cold. The boy was ill, had pus in the nose and a physician curetted out his ethmoids at home, with the aid of a lamp. The boy was brought to the hospital with the symptoms of an ordinary meningitis. The cell count was 1,200 on the first day, and all other tests were positive. There was no evidence of an ethmoiditis except thickening and secretion in his nose. The tissue was shrunk, the secretion was sucked out, and a spinal puncture was done twice a day, all the spinal fluid that would come out being removed each time. This was done for fourteen days, and the staphylococcus was recovered in the fluid. No serum or anything else was given, only the spinal drainage. A neurologist saw the patient and suggested making a cisternal puncture and nothing else except a little sedative in the beginning to quiet the patient. At the end of three weeks he recovered. He had been watched since and there had been no permanent damage.

I congratulate Dr. Ballenger on his effort and on the splendid results he obtained.

SODIUM IODIDE IN HYPERESTHETIC RHINITIS. DR. ALFRED LEWY.

For about two years I have been using with considerable success free iodine solution derived from sodium iodide in the treatment of patients with hyperesthetic rhinitis. I have followed the method recommended by H. Sternberg and M. Sugar (*Ztschr. f. Hals-, Nasen- u. Ohrenh.* **15**:357, 1926), who reported favorable results in acute and chronic nasal discharges and in hyperesthetic rhinitis from the use of the halogens in free solution. The technic with iodine is as follows: A 3 per cent solution of sodium iodide is prepared, sterilized and allowed to stand several days in a clear white glass stoppered bottle until free iodine appears. One cubic centimeter of this solution is injected hypodermically. There is sometimes a temporary exacerbation of the symptoms. The injection is not repeated until after five days. After the solution has stood for several weeks, its injection becomes painful because there is too much free iodine, which is also shown by the increasing yellow coloration. The solution should be discarded and a fresh solution prepared.

If the result is favorable, the injections are repeated as necessary. Most of my patients have had recurrences requiring occasional repetition of the treatment, but some appear to be permanently relieved. Several patients have been relieved by this method after a careful study of allergic reactions and various local treatments had yielded no results. I have also had some favorable results in the initial stages of acute coryza.

In a more recent article, the same authors recommend a 0.3 per cent solution of sodium iodide for patients in whom the 3 per cent aggravates the condition or brings no results. I have tried this twice on patients for whom the 3 per cent solution was ineffective. One of these promptly improved; the other was not helped. With the other halogens, I have had no experience.

MILK OF MAGNESIA AND OLIVE OIL AS A TOPICAL APPLICATION TO MUCOUS MEMBRANES. DR. ALFRED LEWY.

Equal parts of milk of magnesia and olive oil have been used by dermatologists for some time for skin irritations, but I have not known of the use of such a solution for acute inflammations of the nasal mucosa. For some months, I have been using this combination with satisfaction to my patients and to myself. There may be added to this base any of the essential oils, singly or in combination as desired. My favorite combinations are 15 or 20 drops of oil of white pine or of eucalyptol to the ounce of the mixture, this solution appears to be quite stable, but requires occasional shaking. It is especially useful when discharges are excoriating. In subacute inflammations of the nasal mucosa, I have used equal parts of compound fluid extract of benzoin, milk of magnesia and olive oil. Such combinations appear to me to be more satisfactory than any silver salts that I have used, but have the disadvantage of not being applicable through the ordinary medicine dropper for home use. For this purpose, I have used a 1 drachm syringe with a large opening and a heavy rubber bulb. It may be that the preparation will work well in a collapsible tube.

Book Reviews

Otologic Surgery. Revised by Samuel J. Kopetzky, M.D., F.A.C.S. Second edition. Price, $8.00. New York: Paul B. Hoeber, Inc.

The first edition of this work appeared in August, 1925, and was reviewed in the Archives of Otolaryngology in the issue of February, 1926.

Surgery represents a relatively small part of the work which the otolaryngologist undertakes to do; albeit it may often represent the most important part of the work. Surgery of the ear is best understood when viewed from the standpoint of a trained otologist, for it is only from this standpoint that one can get a proper perspective of the indications for operative intervention. The clinical problems of otologic work are not simple, and they require an extensive background in clinical experience to be understood and evaluated properly. Too often textbooks on otology present merely a compilation of surgical hints and suggestions and show very little evidence that the author has acquired any clear insight into otologic problems. The surgical hints and suggestions are in themselves crude and could be much better stated by a general surgeon who has acquired only a smattering of technic in this special field.

The author of this work brings to his problem a carefully trained mind and a clear understanding of the problems with which the otologist is confronted. The book is a valuable addition to the library of the practicing otologist.

The Neck. By Percy D. Hay, Jr., M.D. Volume IX of Annals of Roentgenology. Edited by James T. Case, M.D. Price, $8.00. New York: Paul B. Hoeber, Inc.

This is the ninth volume of a series. The first volume, "Mastoids," was reviewed in the Archives in December, 1929.

This volume on the neck covers a field in which the otolaryngologist has an interest. The volume includes roentgenograms of the normal conditions varying with age and sex, together with a variety of pathologic conditions including foreign bodies. The illustrations are well reproduced and will assist the student materially in gaining a background in experience so essential for the correct interpretation of roentgenograms. The volume contains sixty-six roentgenograms.

Directory of Otolaryngologic and Ophthalmologic Societies *

NATIONAL

American Medical Association, Section on Laryngology, Otology and Rhinology

Chairman: Dr. Robert C. Lynch, Maison Blanche Bldg., New Orleans, La.
Secretary: Dr. Gabriel Tucker, Bronchoscopic Clinic, University Hospital, Philadelphia.
Place: Detroit. Time: June 23-27, 1930.

American Bronchoscopic Society

President: Dr. Thomas E. Carmody, Metropolitan Bldg., Denver.
Secretary-Treasurer: Dr. Louis H. Clerf, 128 S. 10th St., Philadelphia
Place: Atlantic City, N. J. Time: May 27, 1930.

American Laryngological Association

President: Dr. Lewis A. Coffin, 114 E. 54th St., New York.
Secretary: Dr. George M. Coates, 1721 Pine St., Philadelphia.
Place: Swampscott, Mass. Time: May 22-24, 1930.

American Laryngological, Rhinological and Otological Society

President: Dr. Ross Hall Skillern, 1811 Spruce St., Philadelphia.
Secretary: Dr. R. L. Loughran, 33 E. 63d St., New York.
Place: Atlantic City, N. J. Time: May 28-30, 1930.

American Otological Society

President: Dr. S. MacCuen Smith, 1429 Spruce St., Philadelphia.
Secretary: Dr. Thomas J. Harris, 104 E. 40th St., New York.
Place: Swampscott, Mass. Time: May 20-22, 1930.

American Academy of Ophthalmology and Oto-Laryngology

President: Dr. William H. Wilder, 122 S. Michigan Ave., Chicago.
President-Elect: Dr. J. F. Barnhill, Miami Beach, Fla.
Executive Secretary: Dr. William P. Wherry, Medical Arts Bldg., Omaha.
Place: Chicago. Time: October, 1930.

SECTIONAL

Academy of Medicine of Northern New Jersey, Section on Eye, Ear, Nose and Throat

Chairman: Dr. Frederick J. Wort, 1080 Broad St., Newark.
Secretary: Dr. Earl LeRoy Wood, 31 Lincoln Park, Newark.
Place: 91 Lincoln Park South. Time: 8:45 p. m., second Monday of each month.

Eastern New York Eye, Ear, Nose and Throat Association

President: Dr. John P. O'Keefe, 251 State St., Albany.
Secretary-Treasurer: Dr. Arthur F. Holding, 142 Washington Ave., Albany.
Time: Third Wednesday of October, November, March, April, May and June.

* Secretaries of societies are requested to furnish the information necessary to make this list complete and to keep it up to date.

NEW ENGLAND OTOLOGICAL AND LARYNGOLOGICAL SOCIETY

President: Dr. Harris P. Mosher, 828 Beacon St., Boston.
Secretary-Treasurer: Dr. Charles T. Porter, 520 Commonwealth Ave., Boston.

PACIFIC COAST OTO-OPHTHALMOLOGICAL SOCIETY

President: Dr. Arthur C. Jones, 105 N. 8th St., Boise, Idaho.
Secretary-Treasurer: Dr. Walter F. Hoffman, 817 Summit Ave., Seattle.

PUGET SOUND ACADEMY OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY

President: Dr. Will Otto Bell, Medical-Dental Bldg., Seattle.
Secretary-Treasurer: Dr. Francis A. Brugman, Medical-Dental Bldg., Seattle.
Time: 8 p. m., third Tuesday of each month, except July and August.

SOUTHERN MEDICAL ASSOCIATION, SECTION ON EYE, EAR, NOSE AND THROAT

Chairman: Dr. Fred Hasty, 119 Seventh Ave., Nashville, Tenn.
Secretary: Dr. Fletcher D. Woodward, Box 162, University, Va.
Place: Louisville, Ky. Time: November, 1930.

STATE

COLORADO OTO-LARYNGOLOGICAL SOCIETY

President: Dr. Frank L. Dennis, Ferguson Bldg., Colorado Springs.
Secretary: Dr. Rex L. Murphy, Metropolitan Bldg., Denver.
Place: Assembly Room of Metropolitan Bldg., Time: First Saturday of each month from October to May.

EYE, EAR, NOSE AND THROAT CLUB OF GEORGIA

President: Dr. George B. Smith, Rome.
Secretary-Treasurer: Dr. William O. Martin, Jr., 384 Peachtree St., Atlanta.

INDIANA ACADEMY OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY

President: Dr. H. A. Van Osdol, 320 N. Meridian St., Indianapolis.
Secretary: Dr. Robert J. Masters, 23 E. Ohio St., Indianapolis.
Place: Indianapolis. Time: December 10 and 11, 1930.

MINNESOTA ACADEMY OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY

President: Dr. C. N. Spratt, 900 Nicollet Ave., Minneapolis.
Secretary-Treasurer: Dr. J. H. Morse, 80 S. 7th St., Minneapolis.

MONTANA ACADEMY OF OTO-OPHTHALMOLOGY

President: Dr. Lee W. Smith, 125 W. Granite St., Butte.
Secretary: Dr. J. G. Parsons, Lewistown.
Time: Semi-annually.

NORTH DAKOTA ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

President: Dr. George M. Constans, Bismarck.
Secretary-Treasurer: Dr. F. L. Wicks, Valley City.

OREGON ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

President: Dr. J. W. McCollom, 346½ Washington St., Portland, Ore.
Secretary: Dr. Andrew J. Browning, 418 Mayer Bldg., Portland, Ore.
Place: Good Samaritan Hospital. Time: Third Tuesday of each month.

Rhode Island Ophthalmological and Otological Society

President: Dr. J. E. Raia, 272 Broadway, Providence.
Secretary: Dr. F. W. Dimmitt, Jr., 195 Thayer St., Providence.
Place: Rhode Island Medical Library. Time: 8:30 p. m., second Thursday in October, December, February and April.

Utah Ophthalmological Society

President: Dr. F. M. McHugh, 17 Exchange Pl., Salt Lake City.
Secretary-Treasurer: Dr. W. Leroy Smith, Ezra Thompson Bldg., Salt Lake City.

Virginia Society of Otolaryngology and Ophthalmology

President: Dr. H. B. Stone, 303 First St., Roanoke.
Secretary-Treasurer: Dr. Fletcher D. Woodward, Box 162, University.

LOCAL

Atlanta Academy of Ophthalmology and Otolaryngology

President: Dr. Leon E. Brawner, 157 Forrest Ave., Atlanta.
Secretary: Dr. William O. Martin, Jr., 384 Peachtree St., Atlanta.
Place: Academy of Medicine, 38 Prescott St. N. E. Time: 8 p. m., last Thursday of each month.

Baltimore City Medical Society, Section on Otology and Laryngology

Chairman: Dr. Waitman F. Zinn, Medical Arts Bldg., Baltimore.
Secretary: Dr. Moses L. Breitstein, 1212 Eutaw Pl., Baltimore.
Place: 1211 Cathedral St. Time: 8:30 p. m., last Friday of each month.

Chicago Laryngological and Otological Society

President: Dr. Samuel Salinger, 25 E. Washington St., Chicago.
Secretary-Treasurer: Dr. Austin A. Hayden, 25 E. Washington St., Chicago.
Place: Medical and Dental Arts Bldg., 185 N. Wabash Ave. Time: 6 p. m., first Monday of each month from October to May.

Cincinnati Oto-Laryngological Society

President: Dr. Harris H. Vail, 24 E. 8th St., Cincinnati.
President-Elect: Dr. Edward King, Pearl Market Bank Bldg., Cincinnati.
Secretary-Treasurer: Dr. Donald Lyle, 19 W. 7th St., Cincinnati.
Place: University Club. Time: 6:45 p. m., second Tuesday of each month from October to May.

Cleveland Academy of Medicine, Section of Ophthalmology and Otolaryngology

Chairman: Dr. M. Paul Motto, Rose Bldg., Cleveland.
Secretary: Dr. A. D. Ruedemans, Euclid and E. 93d St., Cleveland.
Place: Winton Hotel. Time: Fourth Friday of each month.

College of Physicians of Philadelphia, Section on Otolaryngology

Chairman: Dr. George M. Coates, 1721 Pine St., Philadelphia.
Clerk: Dr. Frederic M. Strouse, 1301 Spruce St., Philadelphia.
Place: College of Physicians. Time: 8:30 p. m., third Wednesday of each month from October to June.

Dallas Academy of Ophthalmology and Otolaryngology

President: Dr. D. L. Bettison, Medical Arts Bldg., Dallas, Texas.
Executive Secretary: Dr. W. Mood Knowles, Medical Arts Bldg., Dallas, Texas.
Recording Secretary: Dr. L. A. Nelson, 4105 Live Oak, Dallas, Texas.
Place: Dallas Athletic Club. Time: 6 p. m., first Tuesday of each month from October to June. The November, January and March meetings are devoted to clinical work.

Detroit Oto-Laryngological Society

President: Dr. C. C. McClelland, David Whitney Bldg., Detroit.
Secretary-Treasurer: Dr. Don A. Cohoe, 13535 Woodward Ave., Detroit.
Place: Maccabees Bldg. Time: Third Wednesday evening of each month from October to May.

Fort Worth Eye, Ear, Nose and Throat Society

President: Dr. W. R. Thompson, 510 Main St., Fort Worth, Texas.
Secretary-Treasurer: Dr. R. H. Needham, Fort Worth National Bank Bldg., Fort Worth, Texas.
Place: University Club. Time: 6:30 p. m., first Friday of each month except July and August.

Houston Academy of Medicine, Eye, Ear, Nose and Throat Section

President: Dr. John H. Foster, 1300 Walker Ave., Houston, Texas.
Secretary: Dr. Edward W. Griffey, Houston Clinic, Houston, Texas.
Place: Medical Arts Bldg., Harris County Medical Society Rooms. Time: 8 p. m., first Thursday of each month from September to June.

Indianapolis Ophthalmological and Oto-Laryngological Society

President: Dr. Robert J. Masters, Hume-Mansur Bldg., Indianapolis.
Secretary: Dr. Kenneth L. Craft, Hume-Mansur Bldg., Indianapolis.
Place: University Club. Time: 6:30 p. m., second Thursday of each month from October to May.

Kansas City Society of Ophthalmology and Otolaryngology

President: Dr. L. R. Forgrave, Logan Bldg., St. Joseph, Mo.
Secretary: Dr. A. E. Eubank, Argyle Bldg., Kansas City, Mo.
Time: Third Thursday of each month from September to May. The November, January and March meetings are devoted to clinical work.

Long Beach Eye, Ear, Nose and Throat Society

President: Dr. W. B. Wright, Jr., 1209 Pine Ave., Long Beach, Calif.
Secretary-Treasurer: Dr. M. A. Schurter, 114 E. 7th St., Long Beach, Calif.
Place: Pacific Coast Club. Time: Last Wednesday of each month from September to June.

Los Angeles County Medical Society, Section of Ophthalmology and Otolaryngology

President: Dr. A. Ray Irvine, 727 W. 7th St., Los Angeles.
Secretary-Treasurer: Dr. J. Frank Friesen, 727 W. 7th St., Los Angeles.
Place: California Hospital, assembly room. Time: 8 p. m., first Monday of each month.

Medical Society of the District of Columbia, Section on Ophthalmology and Oto-Laryngology

Chairman: Dr. Louis S. Greene, 1710 Rhode Island Ave. N. W., Washington.
Secretary: Dr. E. R. Gookin, Medical Science Bldg., Washington.
Place: 1718 M St. N. W. Time: 8 p. m., third Friday of each month.

Memphis Society of Ophthalmology and Oto-Laryngology

Chairman: Each member, in alphabetical order.
Secretary: Dr. R. O. Rychener, Exchange Bldg., Memphis, Tenn.
Place: Eye Clinic of Memphis Eye, Ear, Nose and Throat Hospital. Time: 8 p. m., second Tuesday of each month.

The Milwaukee Oto-Ophthalmic Society

President: Edward R. Ryan, 425 E. Water St., Milwaukee.
Secretary-Treasurer: Dr. O. P. Schoofs, 120 E. Wisconsin Ave., Milwaukee.
Place: University Club. Time: 6:30 p. m., third Tuesday of each month.

Nashville Academy of Ophthalmology and Otolaryngology

Chairman: Dr. R. J. Warner, 706 Church St., Nashville.
Secretary-Treasurer: Dr. W. W. Wilkerson, Jr., Bennie-Dillon Bldg., Nashville, Tenn.
Place: St. Thomas Hospital. Time: 8 p. m., third Monday of each month.

New Orleans Ophthalmological and Otological Society

President: Dr. William A. Wagner, Pere Marquette Bldg., New Orleans.
Secretary-Treasurer: Dr. M. F. Meyer, Canal Bank Bldg., New Orleans.
Place: Eye, Ear, Nose and Throat Hospital. Time: January to June and October to January—third Thursday of each month.

New York Academy of Medicine, Section of Laryngology and Rhinology

Chairman: Dr. Mervin C. Myerson, 12 E. 86th St., New York.
Secretary: Dr. John M. Loré, 240 West End Ave., New York.
Place: 103d St. and 5th Ave. Time: 8:30 p. m., fourth Wednesday of each month from October to May.

New York Academy of Medicine, Section of Otology

Chairman: Dr. Clarence H. Smith, 2 E. 54th St., New York.
Secretary: Dr. James Garfield Dwyer, 57 W. 57th St., New York.
Place: 103d St. and 5th Ave. Time: Second Friday of each month from October to May.

Omaha and Council Bluffs Ophthalmological and Otolaryngological Society

President: Dr. Charles M. Swab, Medical Arts Bldg., Omaha.
Secretary-Treasurer: Dr. J. C. Davis, 1615 Howard St., Omaha.
Place: Medical Arts Tea Room. Time: 5:15 and 7 p. m., third Wednesday of each month from October to May.

Philadelphia Laryngological Society

President: Dr. Henry A. Laessle, 13th and Spruce Sts., Philadelphia.
Secretary: Dr. Herman B. Cohen, 13th and Spruce Sts., Philadelphia.
Place: College of Physicians. Time: 8:30 p. m., first Tuesday of each month from October to June.

Pittsburgh Otological Society

Chairman: Dr. John R. Simpson, 115 South Highland Ave., Pittsburgh.
Secretary-Treasurer: Dr. Watson Marshall, 121 University Place, Pittsburgh.

Rochester Eye, Ear, Nose and Throat Society

Chairman: Dr. A. Vincent Walker, 833 South Ave., Rochester, N. Y.
Secretary-Treasurer: Dr. John F. Gipner, 53 Fitzhugh St., Rochester, N. Y.
Place: Rochester Medical Association, 13 Prince St. Time: 8 p. m., third Monday of each month from October to May.

St. Louis Ear, Nose and Throat Club

Acting President: Senior member of the executive committee: Dr. F. C. Simon, Arcade Bldg., St. Louis, Mo.
Secretary: Dr. M. L. Hanson, Murphy Bldg., East St. Louis, Ill.
Place: University Club Bldg. Time: Third Wednesday in February, April, October and December.

San Antonio Ophthalmolo-Oto-Laryngological Society

President: Dr. F. W. Sorrell, Gibbs Bldg., San Antonio, Texas.
Secretary-Treasurer: Dr. A. F. Clark, 728 Main Street, San Antonio, Texas.
Place: Bexar County Medical Library. Time: 8 p. m., first Tuesday of each month from October to May.

Spokane Academy of Ophthalmology and Otolaryngology

President: Dr. O. M. Rott, Paulsen Bldg., Spokane, Wash.
Secretary: Dr. C. A. Veasey, Jr., 421 Riverside Ave., Spokane, Wash.

Syracuse Eye, Ear, Nose and Throat Society

President: Dr. George H. Rockwell, Physicians Bldg., Syracuse, N. Y.
Secretary-Treasurer: Dr. A. Harry Rubenstein, Medical Arts Bldg., Syracuse, N. Y.
Place: University Club. Time: Second Friday of each month except June, July and August.

THE ARCHIVES OF OTOLARYNGOLOGY is published by the American Medical Association to stimulate research in the field of laryngology and otology, and to disseminate knowledge in this department of medicine.

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